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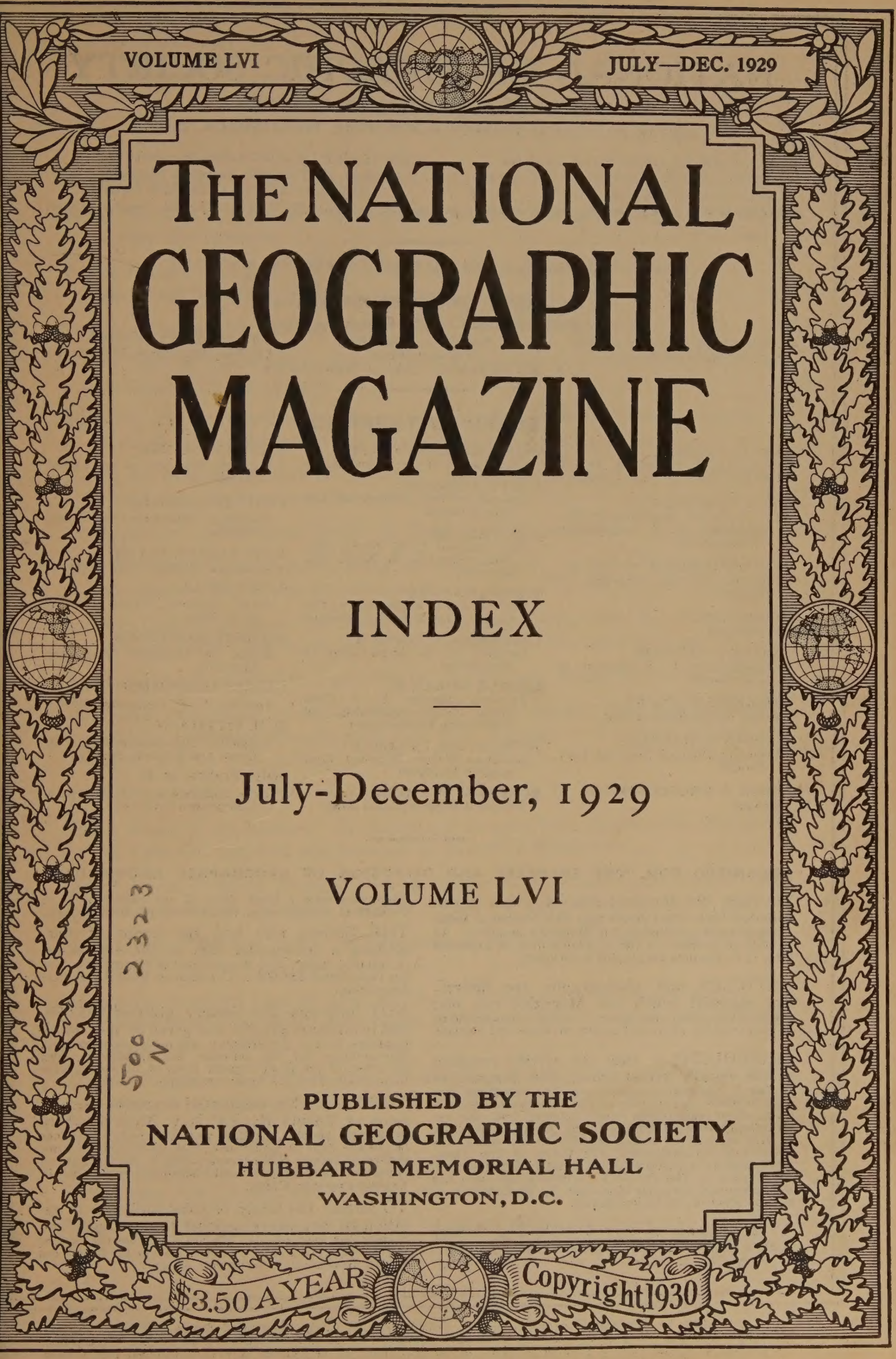

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IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

AT an expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

THE Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole, and has contributed $55,000 to Commander Byrd's Antarctic Expedition.

NOT long ago The Society granted $25,000, and in addition $75,000 was given by individual members to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people.

THE Society has conducted extensive excavations at Pueblo Bonito, New Mexico, where prehistoric peoples lived in vast communal dwellings before the days of Columbus; it is sponsoring an ornithological survey of Venezuela, and is maintaining an important photographic and botanical expedition in Yunnan Province, China.

TO further the study of solar radiation in relation to long range weather forecastings, The Society has appropriated $65,000 to enable the Smithsonian Institution to establish a station for five years on Mt. Brukkaros, in Southwest Africa.

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EXPLORING THE WONDERS OF THE INSECT WORLD

By William Joseph Showalter

Author of "Exploring the Glories of the Firmament," "Exploring the Mysteries of Plant Life," etc., etc., in the National Geographic Magazine

THOUGH intrepid explorers have conquered the earth's opposite poles, climbed its highest mountains, crossed its most dangerous deserts, penetrated its deepest jungles, and sounded its most profound seas, fortunately they have left many realms closer home and less challenging to human endurance where the humblest of us can lead expeditions and from which the poorest of us may bring back rich trophies of new knowledge.

Insectdom is one of these near-by realms that offers rare rewards to those whose eyes are alert, whose minds are keen, and whose patience is unrelenting. It begins in our own dooryards and stretches as far afield as we choose to wander. The man, or woman, or child who turns explorer there will find among its tiny folk more occasions to marvel than Gulliver in all his travels, more reasons to wonder than the fabled adventurer into the topsy-turvy territories of the Kosekins.

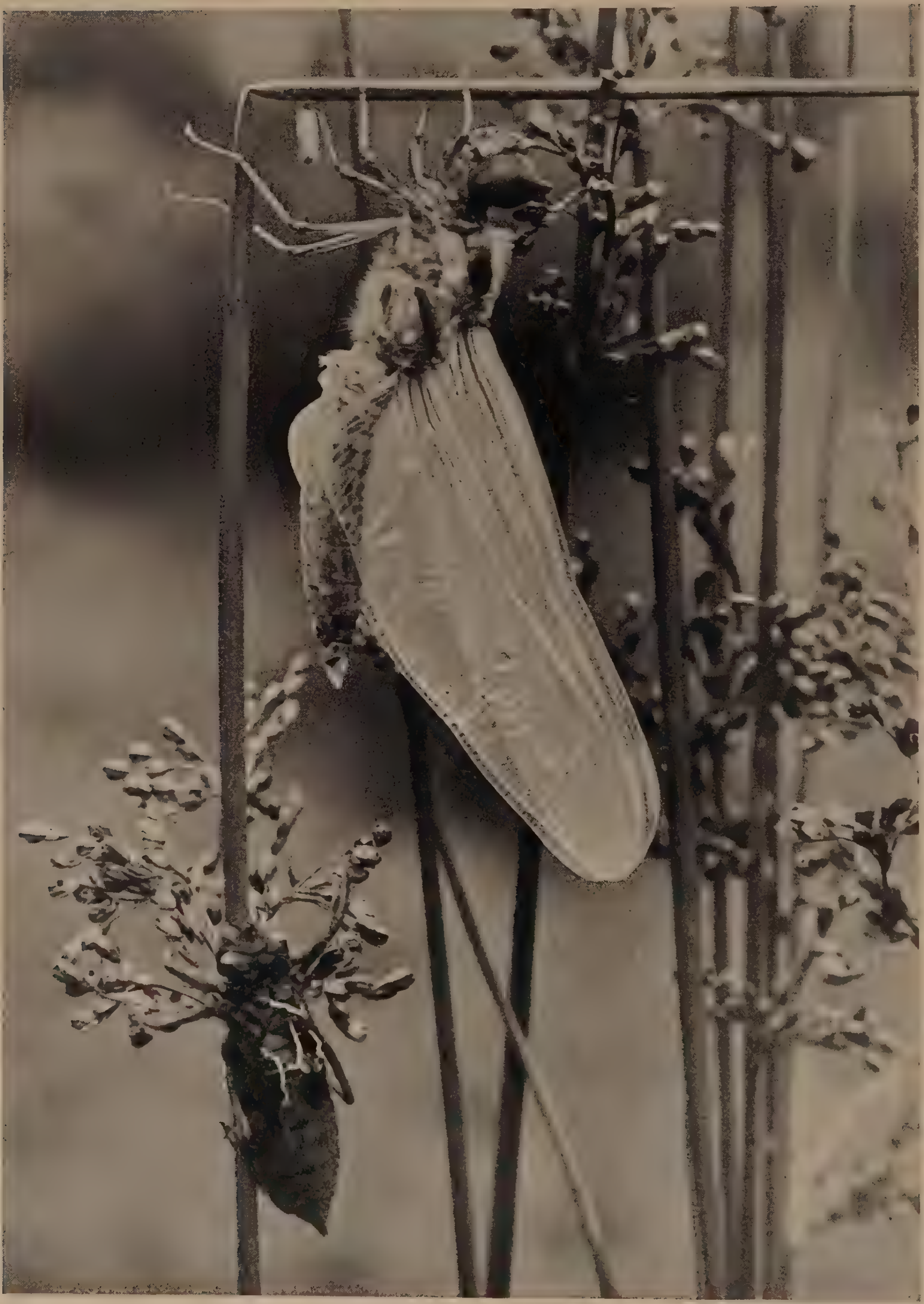
For among the insects one finds habits of life that run the gamut of interest, from the amazing to the bizarre; discovers traits that in some ways seem to transcend human intelligence; beholds untaught powers of foresight that appear to outshine man's most highly trained faculty of taking thought of the future; sees intricate chemical and physical problems solved in a manner worthy of our finest laboratories; gets glimpses of natural powers of perception that go far beyond our unaided senses and rival the detecting powers of the finest instruments that science has brought to the student's aid. One even runs upon solutions of involved social problems that civilization has tried vainly to master.

INSECT FORERUNNERS OF MODERN INVENTORS

Into this wonder world many explorers have gone who could match the intrepid courage of a pole-seeker with the unconquerable patience of a life-history hunter. Whoever reads Fabre and Forel, Comstock and Kellogg, Lutz and Wheeler, the Peckhams and the Raus, and scores of others knows alike what infinite treasures of truth already have been gathered and what bonanzas of interest still lie untouched.

Through such workers as these we have learned that long before our ancestors had emerged from their primeval caves, or had dreamed of a better anesthetic than a club, the glowworm had evolved a sleeping potion so subtle that its victim could not perceive its administration, yet so powerful that nothing could disturb the profound sleep it induced.

When our forbears were dressing in skins and before they had domesticated even the dog, the bagworms, larvæ of the Psyche moths, were tailoring themselves snug coats and close-fitting nightcaps,



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A DRAGON-FLY THAT HAS JUST EMERGED FROM ITS NYMPHAL STAGE

This gauzy-winged creature has just transformed itself from a nymph, such as is shown in the lower left corner of the picture. It will cling to the grass stem until the chitin of its body hardens and until the fluid that flows through the hollows of the struts forming the framework of its wings crystallizes. Then it will be ready to fly away, one of the swiftest of all the insect clan.

while the ants were keeping "cows" and growing "mushrooms" (pages 16, 17).

Before primeval man had learned to kindle his first fire or dreamed of the use of coal, the social bees were employing in hive ventilation the identical principles that industry now uses in keeping pure air in modern coal mines.

While our race was still without the slightest understanding of the functions of the nervous system, some of the wasps had learned to paralyze their prey and to classify insects according to the unity or multiplicity of their ganglia.

Far antedating man's earliest employment of the principles of cold storage and sterile preserving, the wasp was keeping meat fresh for weeks and the bee was storing honey that remained sweet indefinitely.

Long before modern civilization had appeared upon the face of the earth, the caddis-fly's children were building themselves submarines and some species were attacking their victims without warning.

The Eumenes wasp was a finished potter, employing fine natural cements and excellent hydraulic mortars, ten thousand generations before the human artisan knew how to fashion a flint.

The bombardier beetle employed gas against his enemy unnumbered centuries before the oriental invented the stinkpot or man resorted to gas warfare.

AMAZING ADAPTATIONS TO ENVIRONMENT

While man has progressed mainly through the development of the intellect, meeting his problems of existence through the powers of his mind, Nature has helped the insect hosts climb their ladder of achievement by developing their physical adaptations to the requirements of their environment.

For vast ages and countless generations it has been the great Master Breeder sternly, even if so slowly as to make it an almost imperceptible process, weeding out the weaklings and protecting the fit. In this way every physical and instinctual quality that has made an insect more suited to its environment has been further improved.

These processes, employed with such profit by man in the development of qualities that the better meet his needs in flowers, fruits, grains, horses, cattle, dogs, and poultry, have wrought marvelous transformations in the insect, both in body structure and life habit.

Through them the wasp has achieved the poisoned dagger with which to paralyze its prey; the bee has mastered the secret of sex control; the wingless springtail has produced a triggerlike, stiff hair that provides it with powers of locomotion; the adult May-flies of some species have done away with mouths and stomachs because their mature lives are too short to need them; the dragon-flies have come to possess eyes with as many as thirty thousand facets, to furnish the intense vision required in capturing darting, fast-flying prey.

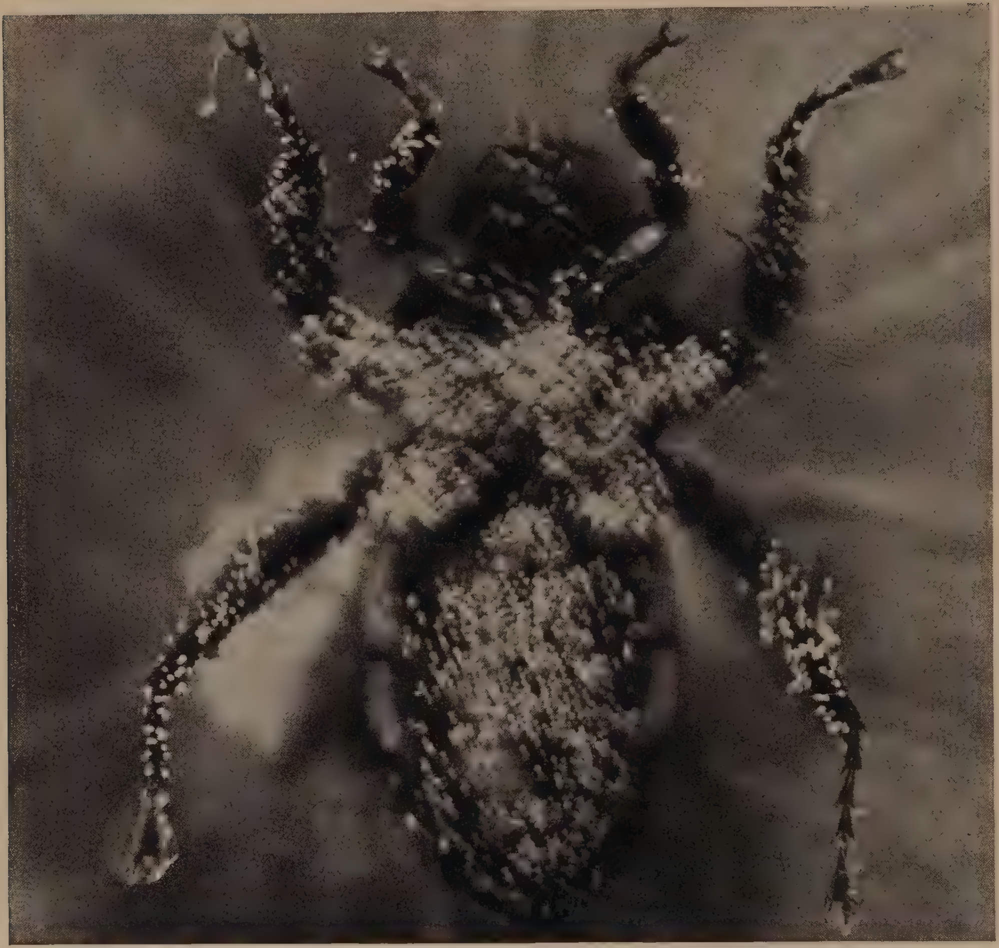
Through these processes, also, the walking sticks have come to look like twigs; butterflies relished by the birds have developed a close resemblance to those the bird's palate detests; certain flies that prefer the precincts of the bumble-bee's nest have copied the bumble-bee's clothes and stature in order to be rated as members of the family rather than as interlopers.

The plant-lice have eliminated males from all but one of their many annual generations, and under laboratory tests have produced 94 generations without the interposition or birth of a single male. The ants bring up heirs apparent to the thrones of their kings and queens, and wood-boring grubs have been known to live forty years in seasoned wood. Carpet-beetles have lived two years in a corked bottle with nothing whatever to eat save the cast-off skins of their own transformations.

THE AGE OF INSECTS

From these fragmentary recitals of some of the ways in which the denizens of the insect world meet their problems of life and solve their enigmas of existence, it is plain that nowhere, either in the fields of fact or fancy, can there be found more surpassing marvels than are to be discovered among the humble folk whom most people dismiss from their minds as mere "bugs."

Man proudly refers to the various epochs of his own history as the Stone



Photograph by Paul Griswold Howes

AN ENLARGED VIEW OF THE UNDER SIDE OF A BUMBLE-BEE, SHOWING HOW POLLEN GRAINS ADHERE TO ITS HAIRS

In visiting the flowers for nectar and pollen out of which to make the paste which it feeds to the larvæ in its nest, the bumble-bee gets a liberal coating of pollen grains. As it passes from flower to flower many of these grains are left on the stigmas, thus fertilizing them. In this way the bumble-bee serves equally well the flowers and the babies of its own household.

Age, the Iron Age, the Age of Electricity, etc.; but, after all, and in terms of epochs immeasurably longer, this is preëminently the Age of Insects. Both in the number of species and of individuals, the insect hosts are the dominant life of the faunal world. As far back as 1907, according to Dr. Frank E. Lutz, more than 384,000 species of them had been described, and the average annual number of new forms found ranges around 6,000. As entomologists penetrate the tropical world more deeply, the annual accretion of new species tends to increase with the passing years.

Estimates of the total number of described and undescribed species range from two to ten millions. Even at the more conservative figure, this would be six times as many as there are of all other animal species combined.

Within a radius represented by a single hour's motor ride, one may find more kinds of insects than there are species of birds in the whole world, and within an hour's walk more kinds than there are species of mammals in all creation.

When the first ambitious creatures of the "bug" world, which bore a rather close

Photograph by Paul Griswold Howes

A SMALL BEE SCRAPES POLLEN FROM ITS FURRY COAT

The coming of such pests as the recently arrived Mediterranean fruit-fly (see pages 10, 11), the European corn-borer, and the Japanese beetle sends shivers of well-founded dread through the American people; but if our bee friends were to leave us *en masse* we would be even more alarmed. Without their pollen-carrying activities most of our flowers and many of our fruits would disappear.

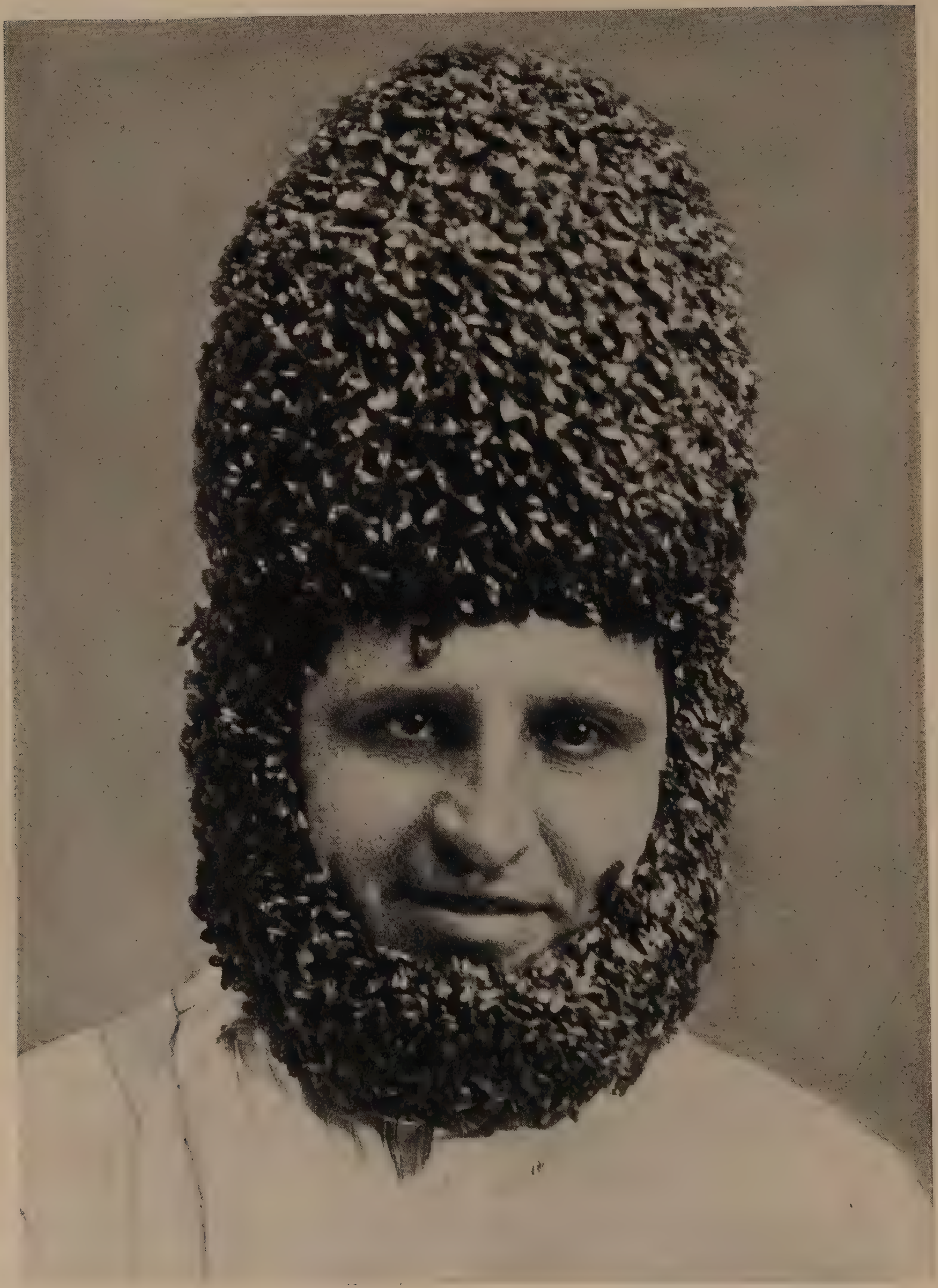
resemblance to our present-day springtails, fish-moths, and silver-fish, began to climb the ladder of winged evolution, releasing themselves from the bondage of feet, they found opportunities for colonization, for multiplication, and for promoting their freedom from enemy attack denied to all creatures limited to legs for locomotion.

AN EONS-LONG STRUGGLE

Chetverikov, the Russian naturalist, describing the trends of early vertebrate and insect life, says that in geological times the vertebrates seemed bent on growing larger, defending themselves in the struggle for survival by accumulating strength. The grass eaters grew larger and stronger, to save themselves from the flesh eaters, and the flesh eaters, in their turn, had to grow stronger and fleeter in order to hold their own in the contest. Finally, both got too big for their environment and both disappeared from the earth, leaving no living species to trace descent from them, and with only their fossil remains persisting to proclaim their one-time existence.

The insects chose another route to survival. With the brevity of life cycle that characterized them, a contest with the vertebrates in size would have been futile; but in smallness they could find a vast number of nooks where they could live in safety, thus filling the chinks and crannies of creation. Just as gravel, then sand and dust, more and more firmly fill the free spaces between the stones in a pile, so the hordes of insects, innumerable as gravel and small as sand, fill the crevices in creation left by the vertebrates.

But even with their smallness the insects of bygone geological ages needed protection. They achieved it by wearing their skeletons on the outside of their bodies and in their wings, and ever since have been growing smaller, although retaining their other major characteristics.



Photograph by Wide World Photos

A HELMET AND CHIN STRAP OF HONEY-BEES

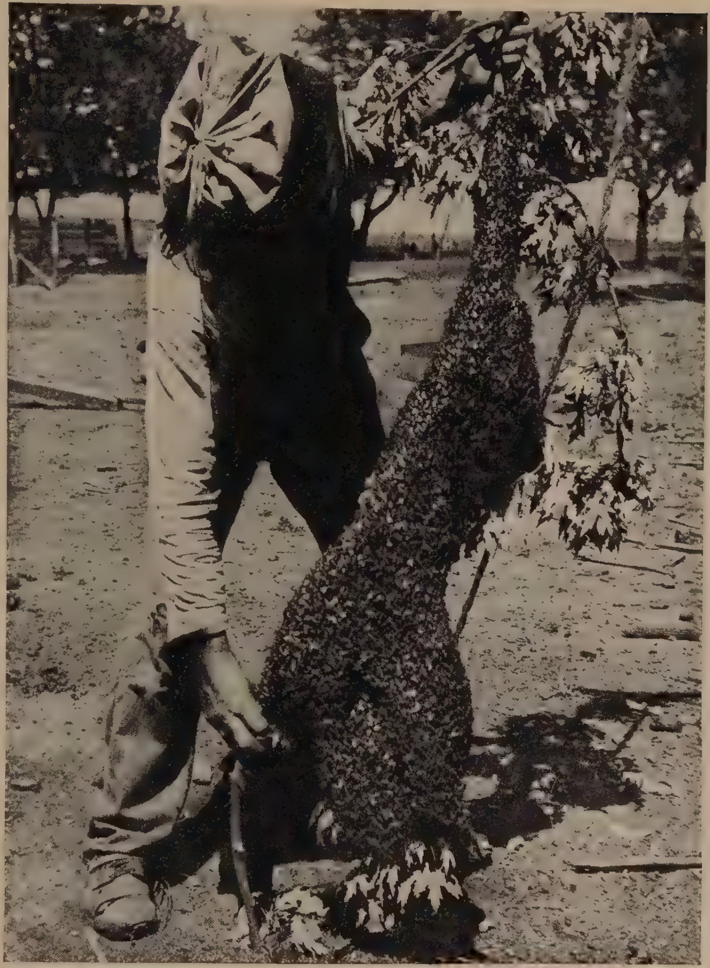
Some strains of honey-bees are mild, sweet-tempered, and gentle; others are nervous, excitable, and cross. Most of them seem instinctively to know who is afraid of them and who is not, and to react to the confidence or fear of those who approach their hives. The Ohio bee-keeper here shown fashioned his dramatic headgear through a gentle and fearless handling of his swarm.

Back in those remote eras when the earth's vast deposits of coal were still living vegetation, the forest swamps were inhabited by cockroaches longer than a man's finger; dragon-flylike creatures with wing spreads of thirty inches pursued the sluggish prey, and ancestors of our Mayflies that were as large as a laborer's hand swarmed around at sunset.

Living on the earth long before man came to take his place in the rôle of one having dominion, the insects will, it is freely predicted by many scientists, still remain long after man has ceased to be a mundane tenant. Dr. W. J. Holland, in his classic work on moths, says:

"When the moon shall have faded out from the sky, and the sun shall shine at noonday a dull cherry-red, and the seas shall be frozen over, and the ice-cap shall have crept downward to the Equator from either Pole, and no keels shall cut the waters, nor wheels turn in mills; when all cities shall have long been dead and crumbled into dust, and all life shall be on the very last verge of extinction on this globe; then, on a bit of lichen, growing on the bald rocks beside the eternal snows of Panama, shall be seated a tiny insect, preening its antennæ in the glow of the worn-out sun, representing the sole survival of animal life on this our earth, a melancholy 'bug'."

Literally true? Certainly not, but a powerful picture of the tenacity of insect life, which was here eons before the first mammal appeared and which probably will be here eons after man's last city shall have been buried beneath the débris of thousands of centuries!



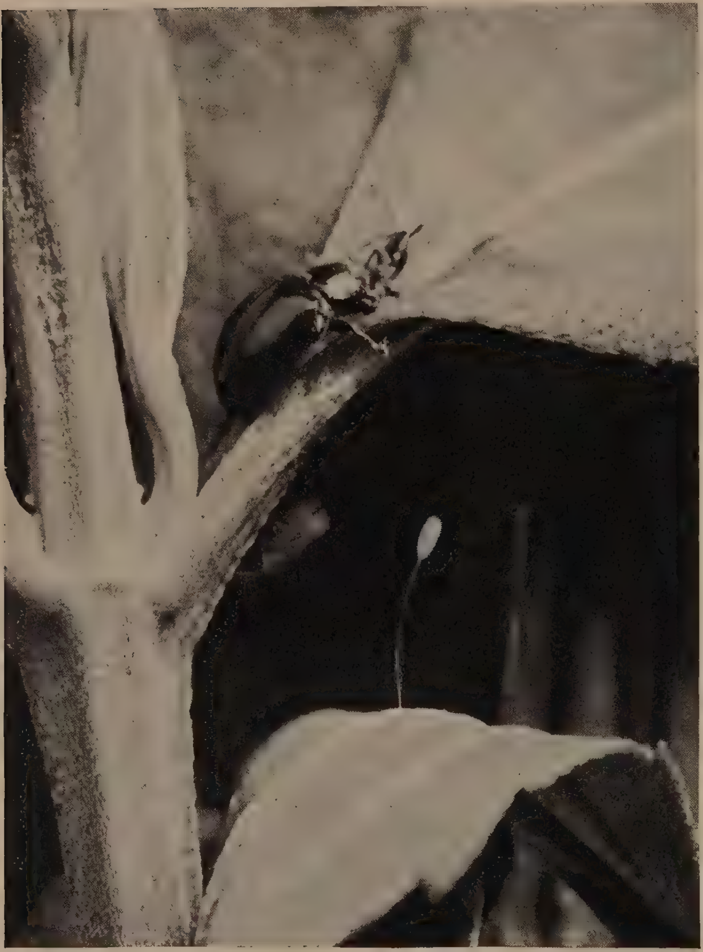
Photograph by Dorothy Smith

A GOOD-SIZED SWARM OF BEES

By the quality of the food given the female larvæ, worker bees determine whether these shall develop into full-sexed queens or whether their reproductive organs shall be so stunted as to make them practically sexless—fellow-worker bees. So well is the royal bee jelly compounded in the hive that even the beekeeper, feeding it to the larva in the cell, can produce a queen at will (see text, page 11).

FRIENDS AND FOES OF THE WINGED WORLD

In the furious struggle for survival which is ever raging among the various species of insects, man gains some won-



Photograph by Paul Griswold Howes

A LADY-BIRD BEETLE EATING A PLANT-LOUSE

The plant-lice have eliminated males from all but one of their many annual generations, and under laboratory tests have produced 94 generations without the interposition or birth of a single male (see text, page 3). On the leaf, supported by a hair to keep it out of harm's way, is an egg of a golden-eyed lace-wing fly. The larvæ which emerge from such eggs resemble tiny dragons, and, like the lady-bird beetles and their larvæ, feed upon plant-lice.

derful allies in his own fight for a place in the sun. They prey upon our insect foes as these latter prey upon our food supplies, whether in field or garner, and prevent them from eating us out of house and home.

The Hessian fly, the codling moth, the San José scale, the army cut-worm, the peach-tree borer, the cabbage-caterpillar, the Colorado potato beetle, the Japanese beetle, the Mexican bean beetle, and the apple aphid are only a few examples of the tremendously prolific species that are uninvited and unwelcome "spongers," which insist on being fed before we ourselves can eat.

It is estimated by careful entomologists that only about one per cent of the insect species is directly injurious to man's crops; but these are so greedy and so prolific that the damage they do in the United States alone amounts to more than a billion dollars a year (see illustrations, pages 10 and 11).

The insectean warfare does not end on the battle ground between our enemies and our friends. It is estimated, indeed, that about 50 per cent of all the species are engaged in preying on other insects, including those whose tremendous board bill we have to pay. Watch the wasps provisioning their nests with grasshoppers and caterpillars, or the parasitic flies laying their eggs on cut-worms and in the egg clusters of other enemies; watch the dragon-flies devouring mosquitoes, or the lady-bird beetles combating San José scale, and you will see our faithful friends rendering a vast, even if unconscious, service to humanity.

But the service of our insect friends only begins when they hold our foes in check. Where would be our fruits and our flowers, where our clovers and our vegetables, were it not for the insects that enable them to set seed for our welfare!

Our fruit crops alone are now worth

some $600,000,000 annually. They would be negligible in quantity and value without the winged messengers that carry pollen from blossom to blossom.

CURIOUS QUIRKS OF THE HUMAN APPETITE

Strange as it may seem, insects and their eggs form favorite articles of diet in many parts of the world.

The Moors fry locusts in butter made from camel's milk, the pupæ of silk-worms are eaten in China, and some species of moths are relished in parts of Africa. Several species of beetles are prized articles of food in Turkey, Moldavia, Wallachia, and elsewhere, while in Nyasaland a paste of May-flies and mosquitoes is eaten with gusto. Some tribes of Mexican Indians, by infusing tiger-beetles in alcohol, make a "hooch" that in the amount of "lightning" it possesses excels any U. S. A. brand of home brew.

Photograph by International

PACKING LADY-BIRD BEETLES IN BAGS FOR SHIPMENT

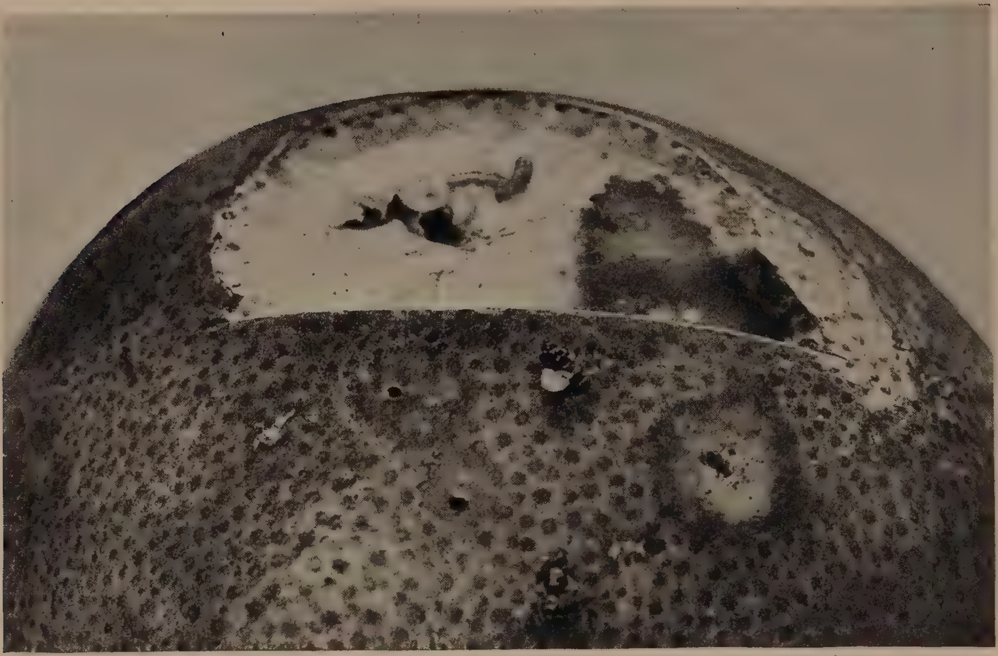
It would be difficult for man to find a better friend among the insects than the lady-bird beetles. They are raised in large quantities and shipped to fruit- and vegetable-growing districts to become allies of man in holding in check scale-insects and plant-lice, which they devour both in larval and adult forms. This shipment is from California.

The insects make important contributions to the world's commerce as well as to regional food supplies. Shellac, which has so many uses, from wax for our floors to stiffening for our derby hats and disk material for our phonographs, is made from lac, the secretion of an Asiatic scale. A beetle known as the Spanish fly is transformed into one of the medical world's principal blistering agents and forms an ingredient of many hair washes.

Tannin and ink are derived from various galls; the cochineal, a scale-insect, is used to make a dye found superior to synthetic dyestuffs for coloring soldiers' uniforms, while the silk-worm is the manufacturer of the world's most prized textile threads, and the bee is maker of one of civilization's most delectable sweets.

THE BODIES OF INSECTS

Some one has remarked that the insects crawl on their backs instead of on their bellies—a statement that is anatomically much more than a half truth. What corresponds in them to our spinal cord lies along the under side of the creatures' bodies; their hearts and stomachs, on the



Photograph courtesy U. S. Department of Agriculture

A GRAPEFRUIT FILLED WITH FRUIT-FLY PUNCTURES AND SHOWING THE MAGGOTS

A single fruit often carries as many as a score of punctures and sometimes as many as a hundred. The maggots are shown in the section from which the rind has been cut away.

other hand, are near the top surface. The skeletons of insects are made up of a series of segments or rings; and, whether in a grasshopper, a dragon-fly, or a moth, in an ant, a house-fly, or a bee, most of these segments are apparent, if examined closely. There are other classes of creatures that have these ringlike segmental skeletons, but to qualify as insects they must have no more than six jointed legs when in their adult form. The "thousand-leggers," the scorpions, the spiders, and the ticks are all cousins, but they are all technically ineligible for membership in the insect "lodge" because they have too many legs.

The circulatory system is amazingly different from our own. In most species the hearts are not complex organs like ours, with divers chambers and sundry valves, but are simple, hollow tubes that contract in waves from end to end. Their blood is not red like ours, but yellowish or greenish. They have no veins or arteries through which the blood moves; rather, it is sent directly through the body cavity, which is filled entirely therewith.

With us, the heart sends the blood to the lungs to be purified and given a new supply of oxygen for its return trip through the capillaries. The insects, having no lungs, get their oxygen, not through the blood, but through little breathing tubes known as tracheæ, which penetrate every part of the body.

FEEDING HABITS OF WIDE RANGE

The feeding habits of this class of creatures are of astounding range. The plant-lice, sucking the sap of rosebush, apple twig, or cucumber vine, love plant juices, just as the mosquito and the flea love animal blood. The honey-bee and the butterfly, drinking the nectar of the flower, are in strange contrast to the sexton beetle and the flesh fly in the quality of their respective appetites.

The wood-borers, satisfied to spend their larval lives eating naught but insipid wood, as they digest their paths through the heart of oak and hickory and elm, have tastes infinitely less spicy than those of the "weevils" that are never so happy as when feasting on Cayenne pepper, or

Photograph courtesy U. S. Department of Agriculture

AN ORANGE GROVE DEVASTATED BY THE MEDITERRANEAN FRUIT-FLY, WHICH HAS RECENTLY MADE ITS FIRST APPEARANCE IN AMERICA

In a bulletin published in 1918 the United States Bureau of Entomology said that there was little danger of the fruit-fly gaining entry through the medium of commercial shipments of fresh fruits. "But quarantine officials have found the pest in fruit concealed by tourists and in mail and express packages sent from infested countries by uninformed persons, and it is by such avenues that the pest is most likely to be introduced." The location of the infested area apparently justifies this prophecy.

of the beetles that know no gustatory joy so satisfying as eating cigarettes.

In the reproductive organs one finds the most startling departures from the orthodox. In evolving their social system, the community-building bees, ants, and wasps have developed highly organized females, which we know as queens, that are marvels of efficiency as egg-laying machines. They mate but once in a lifetime, and therefore have developed a tiny internal pouch in which the male life germs are held.

As they lay their eggs, the honey-bee queens (see Color Plate XII, figure 2) are able, at will, to open or close the orifice of this pouch that leads to the oviduct, and thus to determine whether each egg shall or shall not be impregnated. The ones that are produce females, and those that are not produce males. The queens, it will be seen from this, have come to be masters of the art of sex control.

Then the workers (see Color Plate XII, figure 4) come along with their own development of this art. By the quality of the food they give the female larvæ they determine whether these shall develop into full-sexed queens or whether their reproductive organs shall be so stunted as to make them practically sexless—worker bees. So well is the royal bee jelly compounded in the hive that even the beekeeper, feeding it to the larva in the cell, can produce a queen at will. Yet science never has been able to solve the secret hidden in this queen-making royal jelly.

THE SENSE OF SMELL

In some of the queen-possessing species the neuters will, in the hour of calamity caused by the death of their queen, select one of their own number to function as queen during the interregnum. The larvæ of these, fed the royal jelly, develop into

Photograph by Paul Griswold Howes

A COMMON HORNET STANDS GUARD AT THE ENTRANCE TO ITS NEST

The photographer obtained this picture by building a special scaffold for his camera and using sunlight reflected from a mirror. The hornets and other wasps were the world's first manufacturers of paper. The manner in which they enlarge a little nest smaller than a hen egg into one as large as a half-bushel measure, without disturbing its symmetry or opening up its interior, is a masterpiece in building (see text, page 50).

full-fledged queens, ready to start the colony on its normal course once more.

The sense of smell in some of the insects is almost unbelievably acute. The smelling organs are minute pits or projections on the antennæ and possibly in some of the mouth parts, so arranged as to leave the nerve ends exposed to every odor and at the same time protected from harm. For instance, on a single antenna of an ordinary June beetle there are as many as forty thousand of these olfactory pits.

Some species, with their antennæ removed or covered with shellac, are unable to find either food or each other. If their eyes are blindfolded with pitch and their antennæ left in normal condition, they seem to suffer no inconvenience.

Fabre's classic experiments with the great peacock and banded-monk moths* and with the truffle beetle show to what inconceivable lengths the sense of smell sometimes is developed.

The great peacock moth, the largest in Europe, is clad in chestnut velvet, with a necktie of white fur. Its wings, sprinkled with gray and brown, are crossed by a faint zigzag, edged with smoky white, and studded by a great eye with a black pupil and a variegated iris containing successive arcs of black, white, chestnut, and purple.

A female moth of this species emerged from her cocoon in Fabre's laboratory one May day. That night there came such a swarm of male moths that everybody was astounded. In the laboratory, in the kitchen, in the dining room they gathered. At least forty lovers had come to pay their respects to the marriageable bride born that morning. In eight days at least 150 wooers came to pay court to the moth virgin. Whence came they? Extraordinarily rare in Fabre's region, he thought that some of them must have traveled at least a mile and a half.

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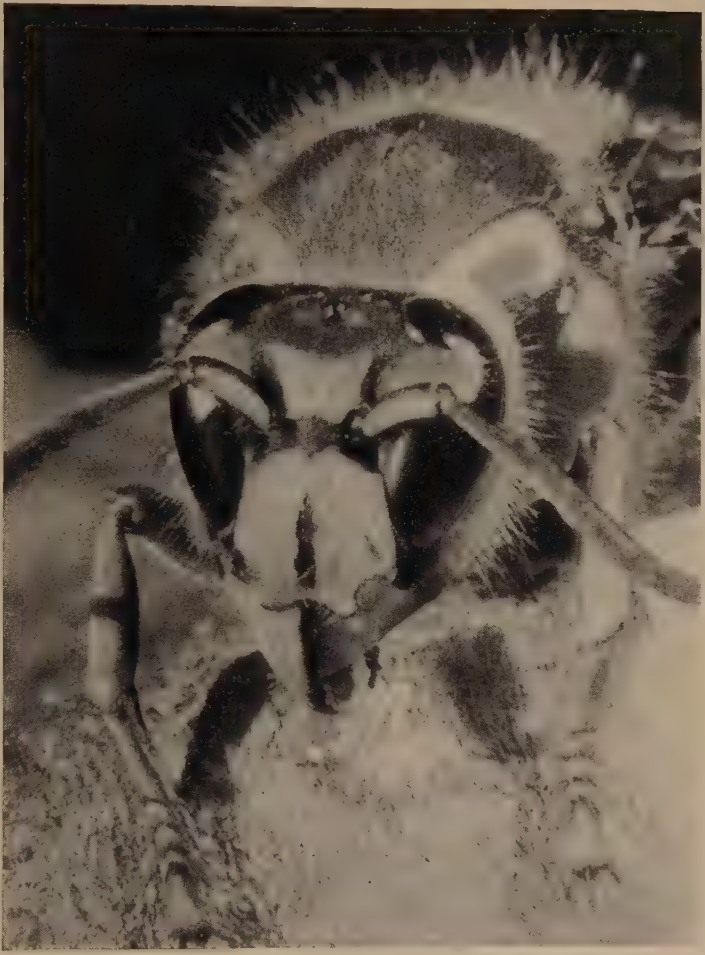
* See "Strange Habits of Familiar Moths and Butterflies," with sixteen pages of illustrations in full color, by William Joseph Showalter, in the NATIONAL GEOGRAPHIC MAGAZINE for July, 1927.

Surrounded with naphthalene, the young virgin's call still went forth and the lovers still came hence; but shut up in an air-tight jar, not a single visitor arrived to pay court. When the antennæ of a visitor were cut off, an operation through which he evinced no pain, he became powerless to locate his affinity, though she was only a few feet away.

So it was with the banded-monk, a day flyer. A chance cocoon fell into the entomologist's hands. The oaks, where the banded-monks made their home, were miles away. Three years of diligent searching upon his own part and that of his family had failed to reveal a single member of this species in any of its stages from egg to adult.



Photograph by Lynwood M. Chace

LOOKING A HORNET IN THE EYE

With its large kidney-shaped eyes, its jointed antennæ, and its pincerlike mandibles, a hornet presents a fearsome aspect when magnified. The members of this family feed their young chewed-up bits of other insects (see text, page 52).

But as soon as the newly hatched insect had reached the mating age swarms of banded-monk wooers came from somewhere out of the distance to pay court to her. This time the naturalist exhausted the whole list of powerful scents and stenches in an effort to overpower her "call." With what he called the concentrated odors of a gas works, a smoker's divan, a scent shop, an oil well, and a chemical factory, he still was unable to conquer the emanation that called the swains from over the hills.

We admire the amazing delicacy of the bird dog's nose. Going at a gallop, on his zigzag way across a field, he recognizes the scent of the quail from that of any of the thousand and one other odors issuing from grass and flower and shrub, from insect and bird and beast. Not only so; he discriminates between several kinds of quail scents, whether they be of the body, foot, or nest; whether fresh or old, or from birds approaching, standing still, or fleeing.

But even the setter's nose is a dull organ of perception beside the antennæ of moths, beetles, bees, and butterflies.

Photograph by Paul Griswold Howes

ANT GALLERIES IN THE CENTER OF A DEAD CEDAR TREE

At the base of the tree which furnished this picture were found fully two bushels of sawdust and chips which have been removed, bit by bit, by industrious carpenter ants (see, also, illustration, page 16). The termites join the carpenter ants in mining wood. Between them the beams of thousands of houses and other structures are weakened and in many communities the problem of termite-proofing structures becomes a serious one.

We are so accustomed to seeing animals with their organs of hearing located in their heads that we are astonished to find that insects have other locations for their ears, and that they employ several principles beside the tympanum in translating air vibrations into sound.

PECULIAR POSITIONS FOR EARS

Among the short-horned grasshoppers (see Color Plate II) the ears are in their abdomens, immediately back of and above the point where the hind legs emerge from their bodies. These appear as small, clear, round spots on the surface of the abdomen.

Katydids and crickets hear with their front legs, in which are located the ears that catch the music of their sweethearts' songs. Among the mosquitoes and midges the ears are in the antennæ—very delicate hairs that communicate the sense of vibration to certain nerves, which, in their turn, transmit it to the brain.

The throat is no more the source of the insects' song than is the head the seat of their ears. Some employ the principle of the violin; others a variation of the drum; still others the idea of the reed. Some make secondary music with organs built after the fashion of the flute, while many employ sign language as effective means of communication.

DRUMMERS AND FIDDLERS

When one hears the sonorous accusation that Katydid (see Color Plate III, figure 3), it can be written down that another Adam is laying the charge at the door of another Eve, for the females of the Katydid family are voiceless. Mr. Katydid has his say with his wings. He rubs his nervure-roughened front wings together. On the one there is a filelike roughness, and on the other a resonant edge—an application of the fiddle-and-bow method of sound production. The

Photograph by Paul Griswold Howes

A PAIR OF ANTS MAKE THEIR TOILET

Living in dark burrows where the sun never enters, cleanliness is a rule of the ant community. They patiently scrub their bodies with their mandibles, so as to remove all adhering particles of dust. The positions into which they have to get to complete their tasks are often startling. Often one may be seen balancing itself on two legs and swinging its abdomen up to its mouth to brush and stroke it with meticulous care. The photograph is very much enlarged.

crickets also are Fritz Kreislers instead of Carusos.

The hum of many orders of insects is a sound produced by the reed method—the rapid vibration of a tongue of some material. In the case of the bee and the fly, one wing is the tongue. The droning among the flowers, the quivering notes when enmeshed in a spider's web, the high-pitched buzz when making a getaway from such a trap—all these speak so plainly, even to human ears, of amiability, anxiety, or anger that one cannot avoid the conclusion that the bee knows how to express her moods as well as we.

There is still another kind of sound production. When a fly gets fast in fly paper we hear its shrill, high-pitched, nervous cry, although its wings are pinioned by the glue. That sound comes from tiny tracheæ, or tubes, with which the body is shot through. The bees have a voice produced in the same way, and any beekeeper will describe the piping of his bees.

It is by piping that the lady mosquito, intent on a meal of warm blood, gives the intended victim warning, thus proving that she is a bold highwaywoman rather than a cowardly thief.

FEATS OF STRENGTH AND ACHIEVEMENTS IN ENGINEERING

When man's strength and achievements in engineering are measured by the standards set by the insects, there are some phases of our success that are overshadowed entirely. In the last Olympics the record for a standing high jump was 6 feet 4⅜ inches. Yet the common flea—*Pulex irritans,* if you want his more exact name—is capable of jumping a hundred times as high as his own head. Were the Olympic champion high jumper able to do as well proportionately, he could clear the Washington Monument at a single bound, with some eighty feet to spare.

Likewise, if man's biggest structure were as large in proportion to the size of

Photograph by Paul Griswold Howes

ANTS AND THEIR APHID CATTLE

Many ants are stock raisers. They herd their colonies of aphids with as much care as a western plainsman tends his cattle. In utilizing the corn-root aphid a remarkable degree of intelligence is shown. In the fall the little insects are taken, in one or another of their stages of life, into the nests of the ants and carefully protected during the season of cold. In the early spring they are carried to the roots of the smartweed and other related plants, where they are "pastured" until the farmers' corn takes root. Then they are carried to the corn roots, which serve as grazing ground for the summer. Each aphid has a tiny tube on the upper rear part of its body, through which it secretes droplets of a sweetish substance which the ants drink with gusto.

the adult human frame as the Pennsylvania ant hill is to the size of the ants that built it, we could boast of a pile five hundred times as big as that wonder of the ages, the pyramid of Cheops; and the Eiffel Tower, built with the aid of all sorts of machinery, is no higher, proportionately, than the ant hill reared with claws and mandibles alone. If the modern baggageman could carry loads as heavy, in proportion to size, as the ants, he could lift a half-ton trunk to the top of the Washington Monument without apparent fatigue.

Kirby and Spence have pictured the strength of insects: "A wild bee or a Sphex (see Color Plate X, figure 1), for instance, will dig a hole in a hard bank of earth some inches deep and five or six times its own size, and labor unremittingly at this arduous undertaking for several days, scarcely allowing itself a moment for eating or repose. It will then occupy as much time in searching for a store of food, and no sooner is this task finished than it will set about repeating the process, and before it dies will have completed five or six similar cells or even more.

"If you would estimate this industry at its proper value, you should reflect what kind of exertion it would require in a man to dig in a few days, out of hard clay or sand, with no other tools than his nails and teeth, five or six caverns twenty feet deep and four or five square, for such an undertaking would not be comparatively greater than that of the insects in question."

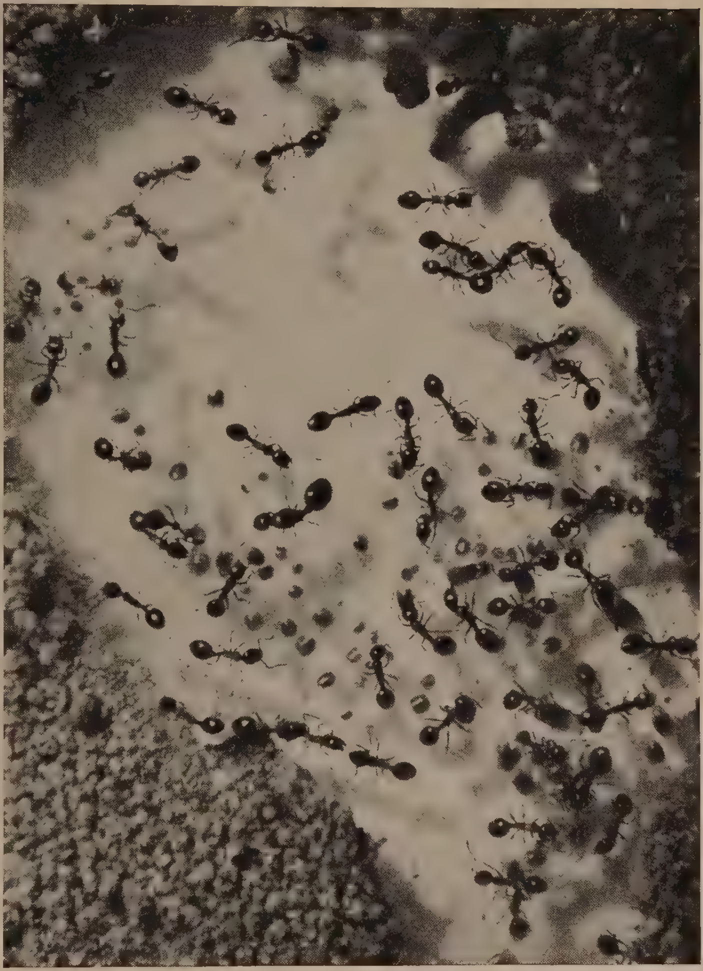
THE COLORS OF INSECTS

Matching the fairest flowers that blow in the richness and iridescence of their coloring, some of the beetles, bugs, and bees rival the butterflies and moths, and even seem to challenge the rainbow itself, in their harmonies of hues (see Color Plates I to XXIV).

The dung beetles of the South American pampa, we are told, combine the fire of gems with metallic luster, and, according to the incidence of light, emit the green reflections of the emerald or the gleam of ruddy copper—rakers of muck that would do honor to the jeweler's showcase.

What Golconda do the scarab (see Color Plates XXIII and XXIV); the azure hoplia cockchafer, the golden apple beetle, and other species visit to gather their gems, and in what diggings do they find their golden nuggets?

THE REASON FOR INSECT COLORS



Photograph by Paul Griswold Howes

THE BUSY ROUTINE OF AN ANT HILL

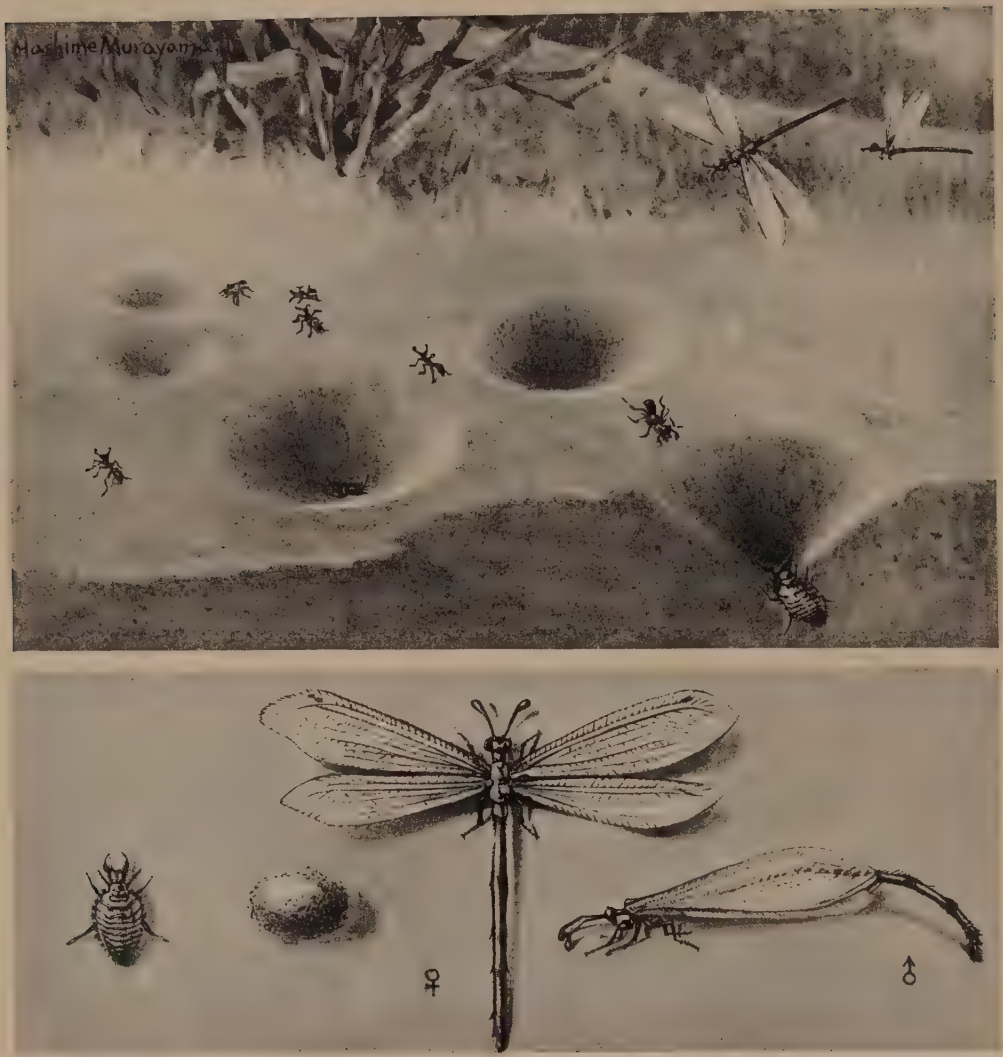
The queen is the largest individual, in the center of the picture. In the group of five ants in the upper right corner two may be seen combing each other, a third is carrying an egg, while the other two rest. At the top is a worker carrying a ball of earth. Whether herding aphid "cows" (see opposite page), making slave raids, growing "mushrooms," or looking after guests of the colony, the ants disclose a remarkable social organization.

The general harmonizing of insect color and pattern with the color scheme of usual environment is recognized generally. It is the art of camouflage developed by ages of necessity for low visibility. Those insects hardest to see have the best chance to escape the birds, the lizards, the toads, and the predaceous insects of other species. Even in a single species, varieties of coloring are found in different localities. In each case the harmony between the insect and its environment is maintained.

Some insects mimic the colors of other species as a protection. The mimicking species are edible to their natural enemies, while the mimicked ones are noted for their repellent taste and therefore are given a wide berth by insectivorous creatures. The nearer the edible folk can imitate the nonedible, the better chance they have to escape a hungry mouth.

THE SEVERAL STAGES OF EXISTENCE

On the other hand, there are some insects noted for their high visibility rather than for their success at camouflaging. They are nearly all distasteful to the insec-



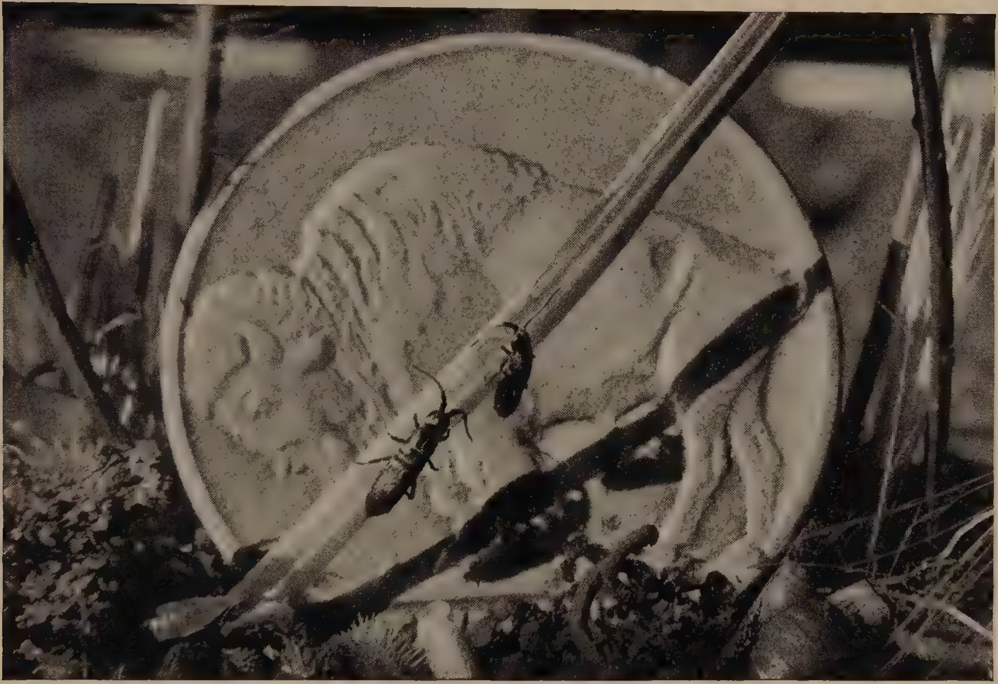
Painting by Hashime Murayama

TRAPS MADE BY WINGED LIONS TO CATCH ANTS

Often one sees symmetrical little craters in dry, sandy spots. These are pitfalls for ants. The winged lion shown below (female left, male right) lays her eggs in sand, and out of these emerge larvæ in the form shown at the lower left of the picture and at the bottom of the cut-away crater. The ant that slips over the edge of one of these traps finds the sand exactly at the angle of repose and can get no foothold to crawl out again. The larva, sensing his struggles, comes out of the sand and captures him. One may induce the little creature to come out simply by tickling the sand in the crater with a straw.

tivorous folk, and they advertise themselves in bold-face type, so that the foe may "read as he runs" that they do not belong to the edible species. Some moths and flies (see Color Plate IX) that are perfectly harmless duplicate in coloration, as well as in outline, bees and wasps that have frightful stings.

The transformations that take place in the insect world are marvelous adaptations to environment. From the tiny egg to the repulsive caterpillar, and thence to the beautiful butterfly; from the slim egg to the fat grub, and thence to the iridescent June beetle; from submarine-building caddis-worm to the lace-winged fly; from



Photograph by Paul Griswold Howes

A GROUP OF SPRING-TAILS BEFORE A BUFFALO NICKEL

These are among the most primitive of the insects. They possess a triggerlike apparatus on the under side of their bodies. When the trigger is released the insect is able to spring great distances. The spring-tails occur all over the world—on land, water, and ice.

the microscopic bee-louse to the blister-beetle—these are a few of the changes that take place in many species.

THE SEVERAL STAGES OF EXISTENCE

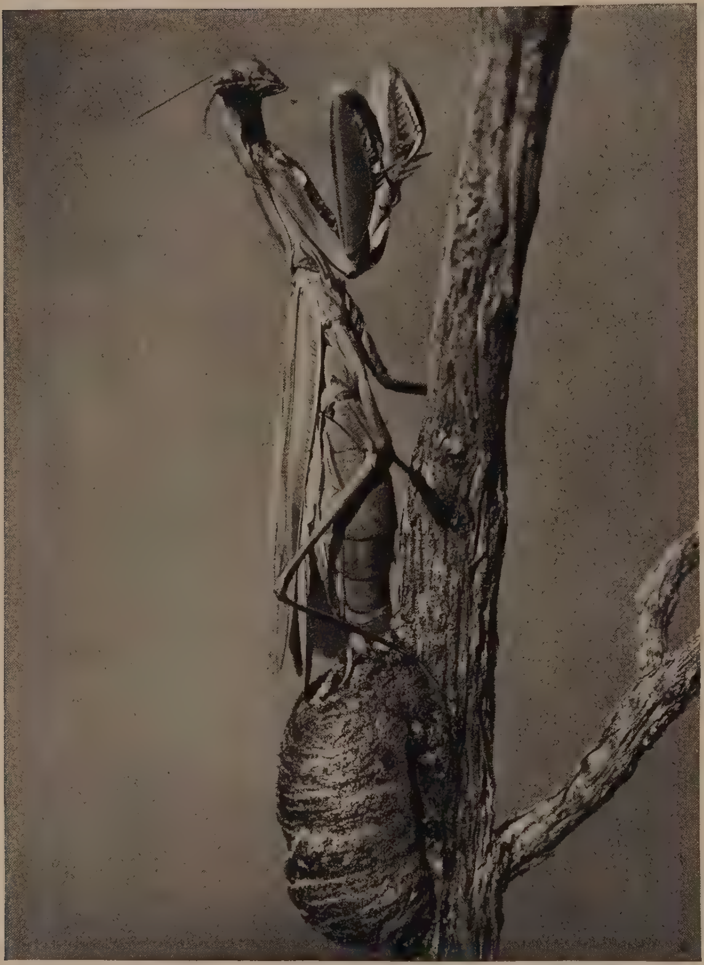
Some species undergo no striking changes on their journey from the egg to the grave except to grow wings. Other species, more numerous, such as the locusts, katydids, crickets, and dragon-flies, undergo striking changes of environment and partial changes in their make-up. In their larvæhood they live in the ground or the water. As adults they could not survive such surroundings. They have many molts. As they outgrow one suit of clothes, it splits open on the back, and they creep out, all "dolled up in a new bib and tucker" of more liberal dimensions. This hardens because of the chitin in it, and splendidly serves its purpose until again the body is too big for its garb, when another splitting on the back marks the acquisition of a more commodious garment.

Various species have their own definite number of molts. The Seventeen-year Locust is thought to get twenty-five new costumes during its heyday of life.

But the beetles, the butterflies, the moths, the bees, the ants, the wasps, the fleas, and such undergo utter transformations—from the egg to the maggot, from the maggot to the pupa, and from the pupa to the fly; from the egg to the caterpillar, from the caterpillar to the pupa, and from the pupa to the moth. The muscles change, the digestive tract is transformed, the creature's whole being is so made over that the environment of its one form would be fatal to its other.

Imagine a butterfly eating solid food, a June beetle (see Color Plate XXIII, figure 9) forced to live under ground, or a caddis-fly trying to dwell at the river bottom!

But the caterpillar does not eat for today alone. It foresees a morrow when, undergoing its transformation, it will have to spend days on end without a single bite



Photograph by Paul Henri Fabre

A PRAYING MANTIS (ACTUAL SIZE) LAYS HER EGGS

The mantids deposit their eggs in curious masses, covered with a quick-drying mucus, on branches and plant stems, in the late summer and fall. From these the young emerge during the following summer and soon grow to maturity, molting several times and developing wings in the interim (see text, page 28).

of food, the while its entire interior, except possibly its nervous system and reproductive glands, turns into a thick fluid in which float bits of degenerating tissue. While the débris of the disintegrating larval body is being melted into liquid in this strange alembic of Nature, the fluid, in its turn, is being transformed into new tissues and new organs.

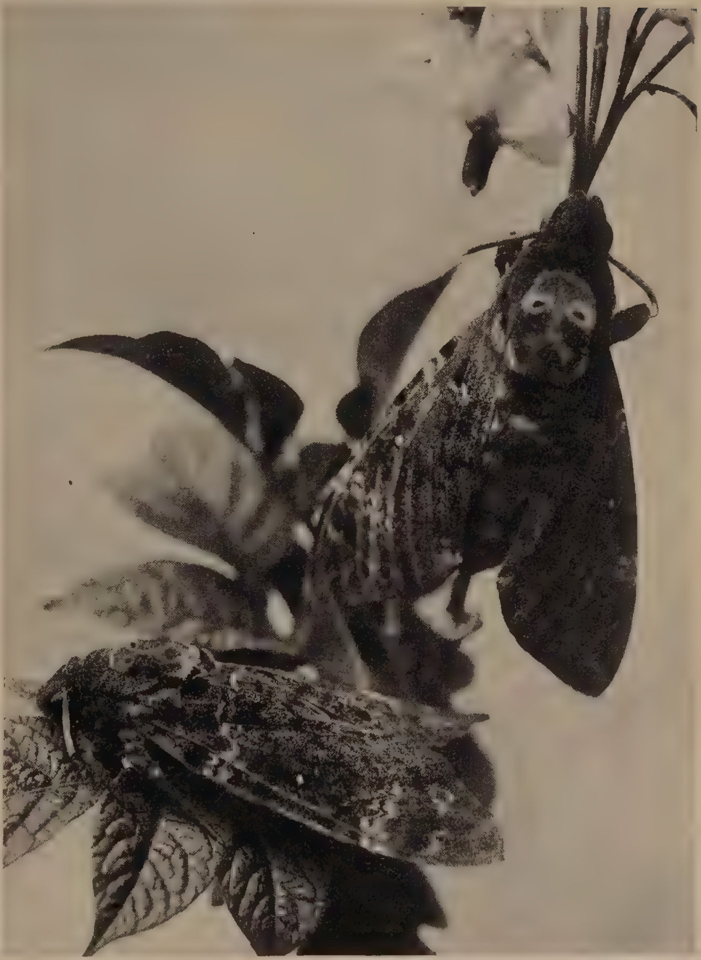
MARVELOUS MANIFESTATIONS OF INSTINCT

"One marvels," observes an English naturalist, "at the skill displayed by the bird in constructing its first nest; but it may be said that the newly mature bird has at least had a chance of watching a second-year matron of its kind building and getting some hints that way. In the case of the insects there is, as a rule, no possibility of such help. In the majority of species the mother is dead long before the daughter comes to that stage of existence when the necessity of providing for her progeny arises; so the knowledge has to pass by way of transmitted memory.

"Somewhere in the minute speck of protoplasm constituting the egg of one of the solitary bees, for instance, there is an infinitesimal particle of nerve matter which contains the secret of how to cut accurate circles and ovals of roseleaf so that a given number of them will overlap and curve into a perfect cylinder. During the greater part of its life the creature which hatches from that egg will have no need of the secret, but the germ of it will go on developing, and when the bee has reached its adult form there is the idea in the memory cells ready to instruct the nerves that govern the action of wings and legs and cutting jaws."

The milkweed butterfly sips the nectar of flowers and never touches green leaves. Its caterpillar, however, would starve on rations of nectar. The butterfly knows, or—to be literally accurate, instead of figuratively correct—acts as if it knows, that the caterpillars which are destined to hatch from the eggs it lays must have green food, so it always lays them on leaves.

Likewise, one of the Meloe blister-beetles, cousin of the Spanish fly, lays its eggs by the thousand—perhaps four thousand the first day, three thousand the second, two thousand the third—near the burrows of certain mining-bees. Then, exhausted by the Herculean task of insuring the perpetuation of the species, the mother beetle crawls away and dies. Presently an innumerable host of small creatures come out of the ground, seek out the flowers frequented by the bees, such as the composites, and then hop onto the bees' backs as they come for nectar and pollen.



Photograph by Paul Henri Fabre

THE DEATH'S-HEAD SPHINX MOTH

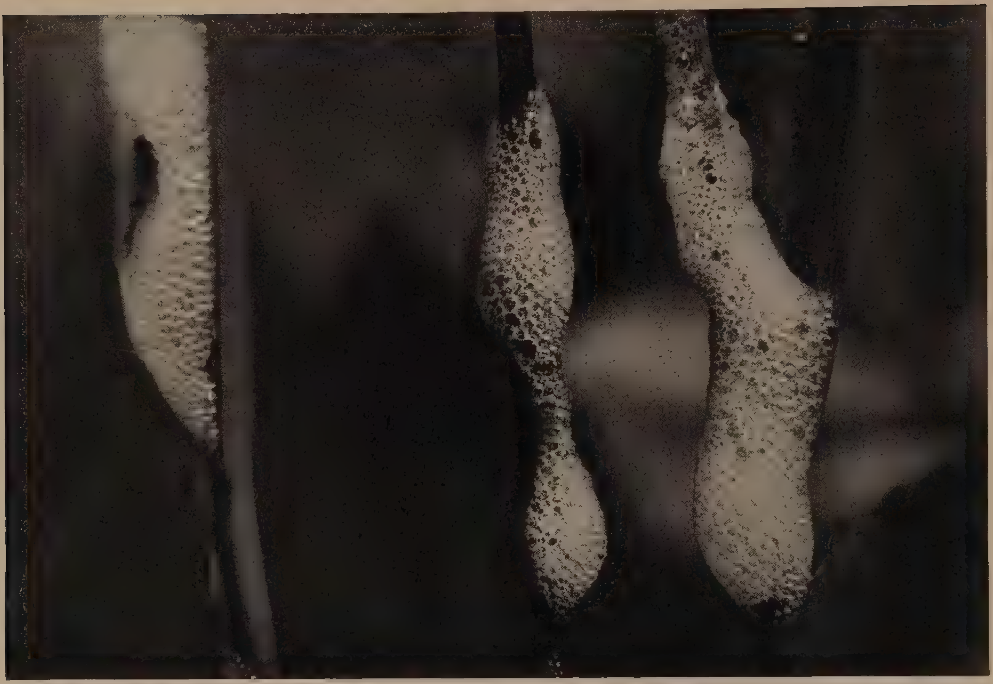
Somehow this strangely marked insect has learned the secret of the queen bee's piping and has mastered the art of imitating the call of the mistress of the hive. The bees could without difficulty sting it to death. But they allow it to enter without protest and to lay its eggs. The larvæ spin webs that do great damage to the bees' household.

A MURDERER UNMASKED

For a long time these tiny creatures were believed to be a species of louse infesting the bees, until Newport, the English entomologist, found them to be the babies of a Meloe beetle. Then Fabre studied them and found further that after one is safely ensconced in Mrs. Bee's fur it rides around on its animated airplane until she has provisioned her cell with pollen and honey. Then, at the moment the bee lays her egg on the pollen and honey, the little scamp makes a flying leap from the back of its hostess and lands on the newly laid egg, which it proceeds to use both as a life raft and a larder.

The poor bee, aiming to plant a germ of life, unwittingly permits this germ of death to fasten its tentacles to her hopes. She seals up the cell, but not for her own. The baby Meloe promptly tears open the shell and proceeds to feast upon the contents of the egg. Then it goes to sleep. For several years it stays in the cell it stole from the bee, taking divers naps therein, each time waking up transformed, and finally emerges a full-fledged Meloe beetle, ready to start the cycle all over again.

Only once in its life did the tiny creature have occasion to seek out a plant in which to hide; only once, occasion to steal



Photograph by Paul Griswold Howes

MASSES OF FROTH MADE BY FROG-HOPPERS

The frog-hoppers are a group of small, flat, brown or gray insects, which occasionally occur in sufficient numbers to injure grapes, cranberries, or pasture grasses. They get their popular name from the belief that these masses are the spittle of tree frogs. Their young, which in the earliest stages have no wings, a little later developing wing pads and finally wings, often are found imbedded in these masses, which apparently are used for a shelter.

a ride; only once, occasion to select a laying place contiguous to the harvest bee's home. Yet, with all the order of the succession of notes in a run on the piano, each act was performed with a sureness and a deftness as only man can show in his doings after years of training.

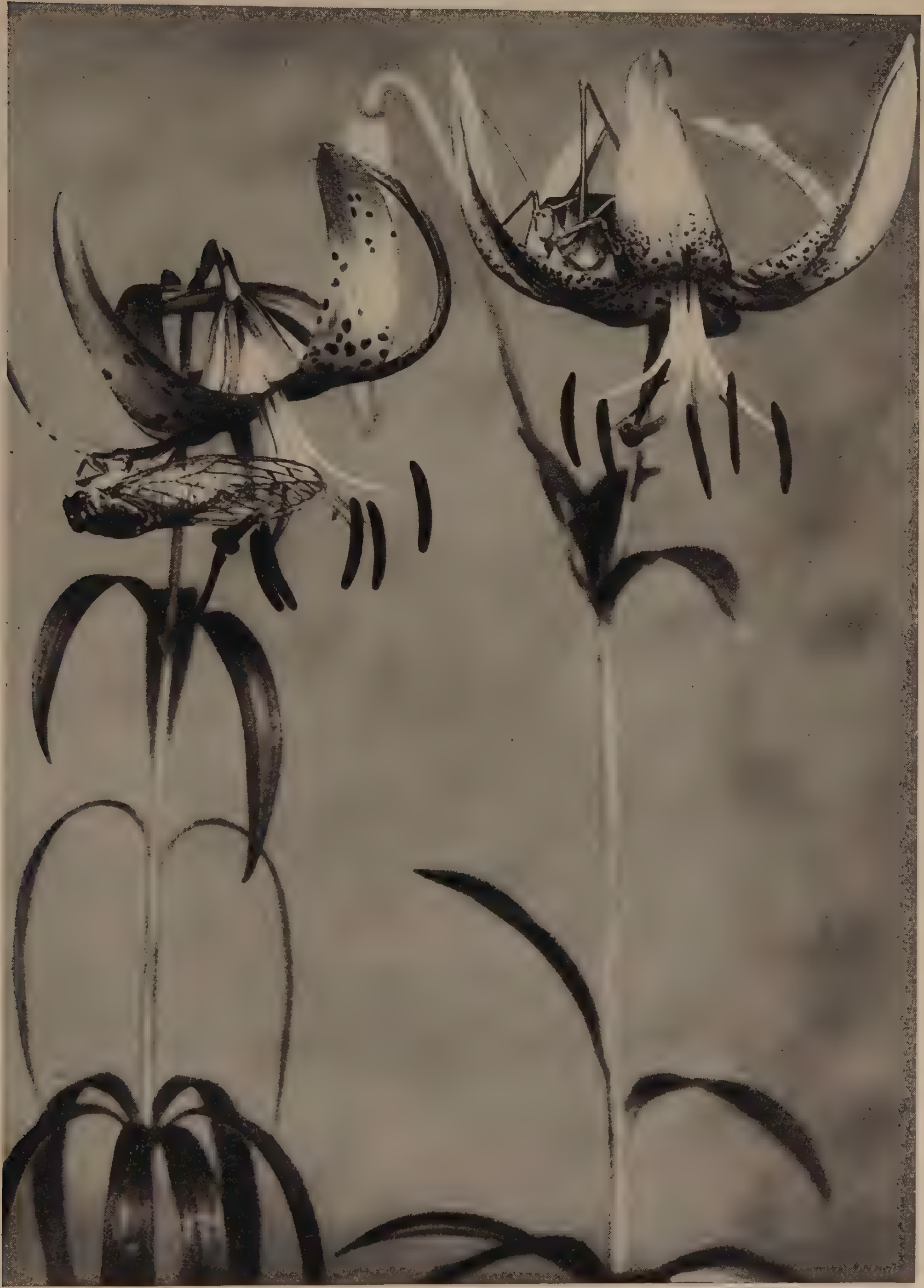
THREE YEARS IN THE SILENT HEART OF THE OAK

So, too, it is with the oak-boring grub and the long-horned Capricorn beetle (see Color Plates XX and XXI) into which it is transformed. From an egg in a crevice in the bark of a tree does this grub come into existence. The mother is dead long before the grub begins to live. A tiny creature it is when emerging from the egg, but with a powerful set of woodworking tools in its head.

Three years it will spend eating its way through the wood of the tree. In the silent, somber solitude of the oak's inmost heart it eats its ever-broadening, ever-lengthening path. It has no eyes, for of what use could eyes be to a creature living in the utter absence of light? It lacks ears, for what could there be of interest for it to hear when utter stillness reigns perennially? And nose—what warning could a nose give, what gustatory delight, what olfactory happiness, where there is nothing but oak wood to meet, nothing but oak wood to eat, nothing but oak wood to smell?

And yet "this-nothing-at-all is capable of marvelous acts of foresight; this belly, which hardly knows aught of the present, sees very clearly into the future." After three years of eating, it finds itself called into the deep sleep from which it is destined to awaken as a full-fledged, stiff-armored, long-horned Capricorn beetle.

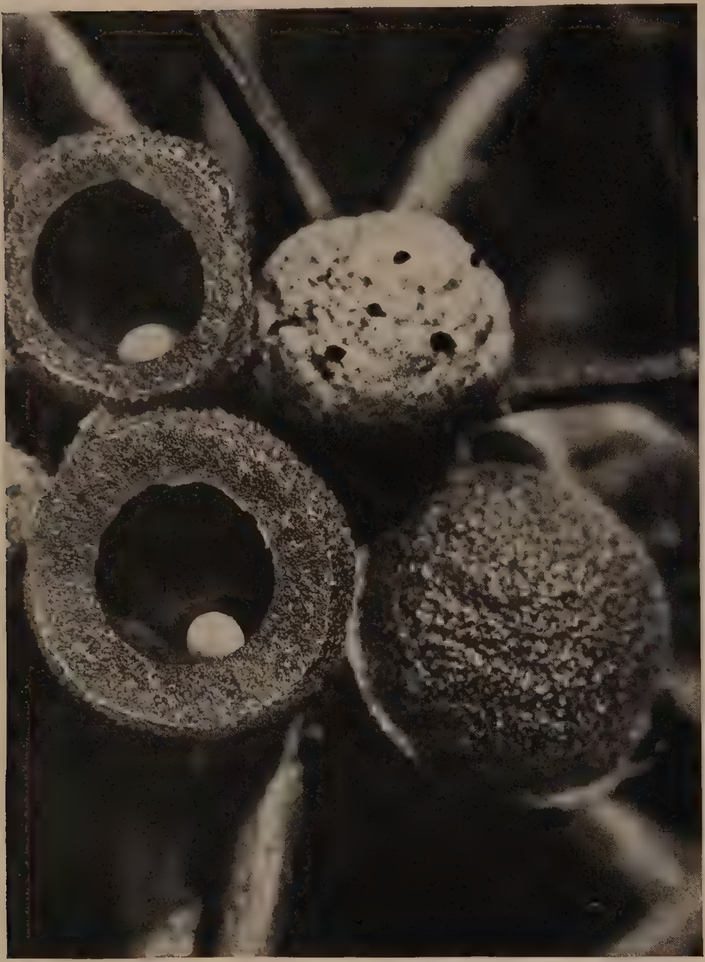
Urged on by an unfathomable presentiment to prepare for what never has happened before in its experience, at this juncture the grub bores to the surface, even braving the keen ears of that ancient



Photograph by Lynwood M. Chace

A SONGSTER OF THE DAY AND A SERENADER OF THE NIGHT

Hanging on the Turkscap lily at the left is a harvest-fly whose tuneless buzz fills the air on an August day. Upon his colorful balcony at the right Mr. Katydid looks out upon the scene. But his undefined accusations against the mysterious Katy (see text, page 14) will not be heard until eventide, when the harvest-fly is wrapped in silence.



Photograph by Paul Griswold Howes

A GROUP OF GALLS MADE BY INSECTS

One often notes galls on plants of many kinds. While some of these peculiar formations are caused by certain kinds of fungi, most of them are produced by insects. The two open and one closed gall are of a type developed by one of the cynipid gall-flies. The whitish gall was produced by another species, whose young have emerged. In the two opened galls lie small capsules, out of which would have emerged young gall-flies if they had been undisturbed. The gall-making insect lays its egg in the twig, where an irritation results in a swelling which serves as a shelter for the young.

foe of its race, the woodpecker, in order to provide an exit way for the beetle to be. Then it retreats a bit, excavates a transformation chamber, which is lined with a swan's down fabricated from sawdust. This is barricaded with triple doors made from uric-acid secretions and bits of wood fiber. After these elaborate preparations, the grub lies down to the deep sleep of the transforming period.

But does this sleep-overtaken grub ever turn its head away from the exit? Not it, for by some strange plan of Nature this animated sausage has inherited the guidance that makes it act as if it had full foreknowledge that it is destined to wake up a full-fledged beetle, too stiffly armored and too well provided with horns to permit it to turn around in its narrow cell.

STRANGE COMBINATIONS OF WISDOM AND IGNORANCE

Perhaps the French larva known as the Pine Processionary, a tent-building caterpillar resembling in some ways our own familiar apple tree tent-caterpillar, affords entomology's classic example of blind ignorance coupled with seemingly surpassing intelligence.

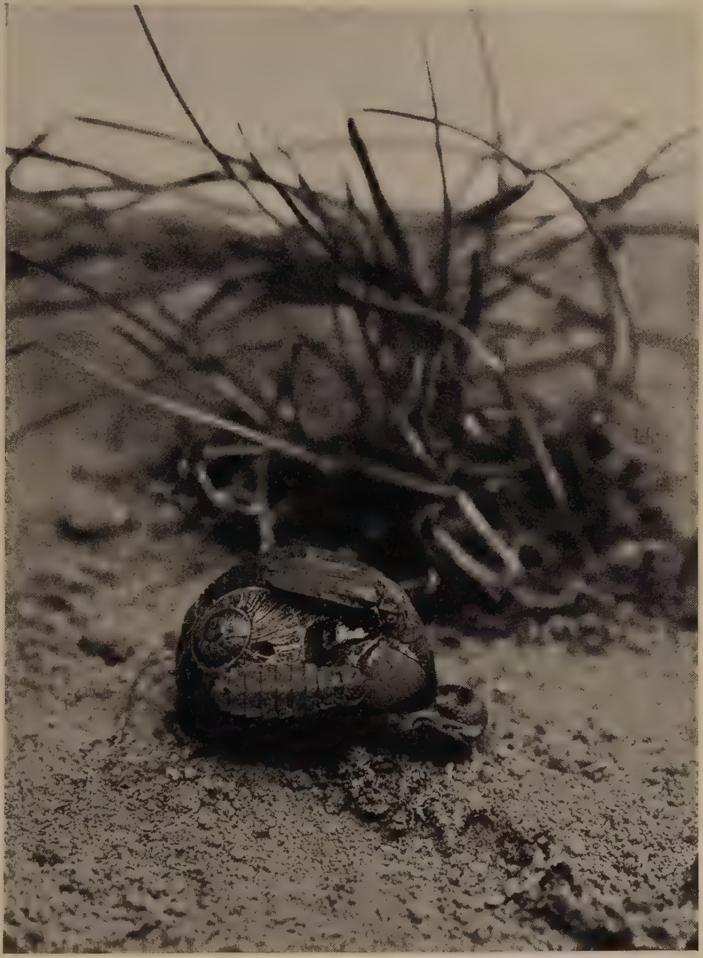
Fabre, in his "Souvenirs entomologiques," gives a dramatic picture of this caterpillar's behavior under varying circumstances. It is the larva of a moth closely related to the silk-worm moth. In laying her eggs, this moth takes down from her own body to make a cover for her eggs, just as the eider duck plucks the downy feathers from her own breast to make a warm nest for her young.

After emerging from the clustered eggs in late summer, the tiny caterpillars set to work to build themselves temporary silken tents; but when the tang of autumn touches the air, they construct a larger habitation, of such strong silk that it can weather the winter gales without difficulty. By the end of winter this may be as large as a half-gallon measure — "the interior a combination of a ragshop and a sewage farm."

As they march forth from their tent on a sunny day for a meal of pine needles, the caterpillars travel in single file. There are no natural leaders, whichever happens to go first being, for the moment, the leader. Now it is this one and now that, but each caterpillar leaves a trail of silk behind it that acts as a life line to guide it back from the grazing grounds to the nest.

One day Fabre succeeded in getting a procession to start around the rim of a big palm vase. He cut the line where it reached the rim, and the caterpillars, completing the circuit of the rim of the vase, unwittingly, guided by the life line they had left behind, started around again. All day long they kept marching around and around, for there was a solid ring of caterpillars, each with its head to the tail of the one before it. Far into the night they still journeyed on, slaves to their life line and bound to follow the one ahead. Morning dawned, finding them motionless and in a torpor, but still in formation.

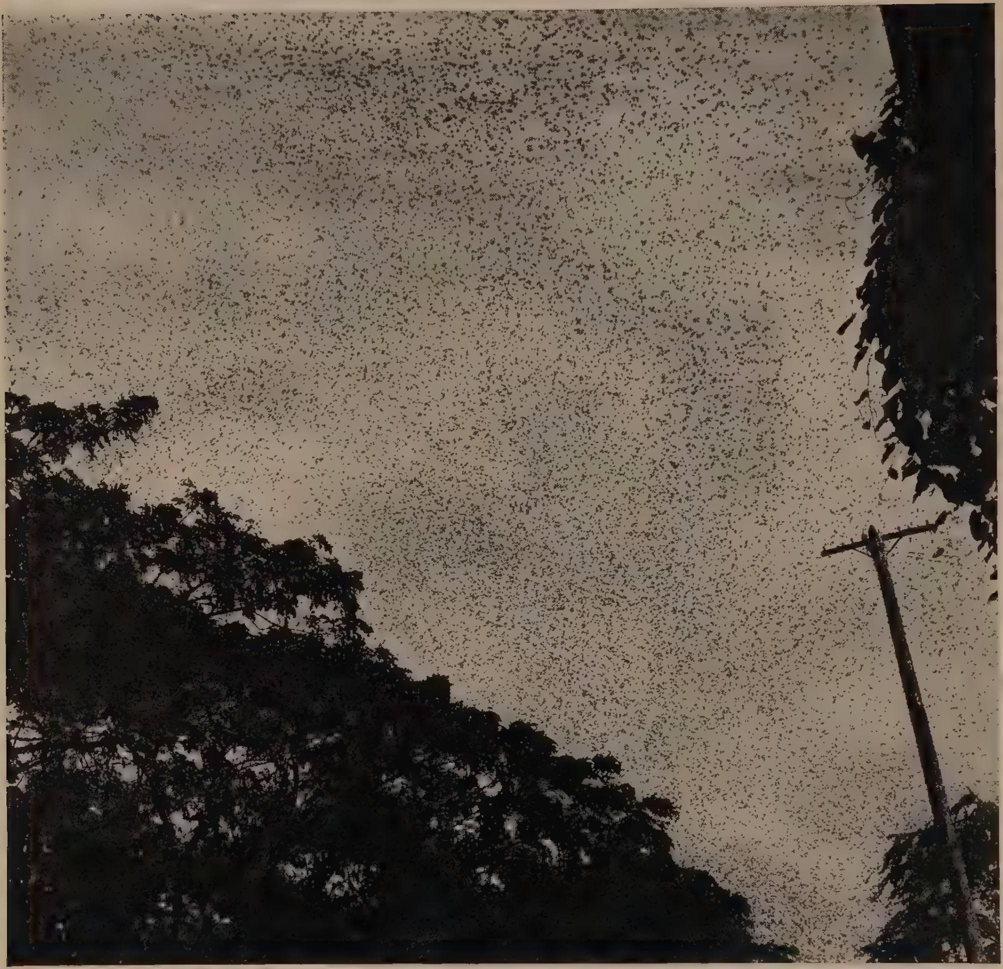
With the warmth of the sun upon them and the urge of their appetites within them, they resumed their patient march. On and on, around and around they went. Night came again, with its weary halt, and another morning with its patient resumption of the unending path. A few stragglers sought a way out of the circle, but came back and resumed the gruelling march. The third night came, with its halt, and another morning with its marching. So the fourth and the fifth. Footsore and weary, there were stragglers and confusion. The ring of caterpillars became a series of short processions, which again were united before the close of the



Photograph by Paul Henri Fabre

A GLOWWORM EPICURE DINES ON SNAIL

Stealing up on the snail, the assailant administers an anesthetic so subtle that the victim is not aware that it has been attacked. After the anesthetic has become effective the glowworm covers small sectors of the victim's body with a peptonized saliva, which predigests the snail's tissue and turns it into an edible broth.



Photograph by Charles Martin

A FLIGHT OF LOCUSTS OVER AN ISLAND OF THE SULU SEA, PHILIPPINE ISLANDS

day. The sixth night, the seventh day, the seventh night, and still the go-round that was far from merry kept up, and with its marchers as footsore and weary as were ever members of Stonewall Jackson's foot cavalry or John J. Pershing's heroes of the Argonne drive. The eighth day dawned, and with it came a desperation that led them singly and in groups to fall out of ranks, and before night had come again the last one had found his nest once more.

FORECASTERS OF THE MORROW'S WEATHER

Eighty-four hours on the march and eighty-four in bivouac, with never a mouthful to eat, with never the comforts of the home nest, all because of a slavish devotion to a life line and the instinct to follow the fellow ahead!

Prize "boneheads" of insectdom? Perhaps so. But wait! These same caterpillars, to whom being caught out in a rainstorm would be fatal, have developed, Fabre tells, methods of forecasting the weather that for weeks, during careful observations and comparisons with the records of the French Bureau of Meteorology, showed an amazing foreknowledge of the approach of foul weather.

Fabre, who has been called the "Homer of the Insect World" and the "Incomparable Observer," and whose son is following in his footsteps through his striking photographic researches, as revealed in many of the illustrations accompanying this article, has written at length on the strange intermingling of blank ignorance and surpassing foresight among the winged hosts.

SKILLED INSECT SURGEON HAS A MENTAL "BLIND SPOT"

The Pelopæus wasp, a splendid potter and an exquisite surgeon, able, with equal facility, to build an ideal cell for her unhatched young and to paralyze, without killing, the spiders with which she provisions it, was unable to detect the removal of the first spider, with its attached egg, when she brought in the second one. Furthermore, she was unable to detect even the removal of the cell itself, and proceeded to plaster the bare spot where it had been, even as if it were there.

Likewise, the familiar Sphex wasp, one of the most highly skilled huntresses of the insect world, knows exactly what species to capture for her future babies, where to sting them so as to produce paralysis instead of death—meat preservation without salt or cold storage—but she seems to display utter stupidity at times. It is her practice to leave her cricket at the entrance while she goes below to see that all is well before she takes it down. Forty times Fabre moved the cricket back from the entrance no more than six inches. Forty times Mrs. Sphex dragged it up to the entrance again, going down each time for another needless inspection.

Some species of Bembex (see Color Plate X) wasps do not provision their burrows, but bring the prey to their young as they need food, after the fashion of the birds. The entrance to their burrows is always in the sand. After getting down a little distance in more substantial soil, the gallery runs approximately parallel to the surface. On the surface there is no mark by which even a Fabre can detect the entrance.

Whether Mother Bembex comes in or goes out, the door of sand always closes behind her. She wanders far in search of prey, but always finds her doorpost as easily and definitely as if it were so plain that those who run might see it. Yet if one excavates the gallery, leaving the entrance intact, she will go through the door, come out of the open gallery, go through the door again, and repeat the performance again and again. At the end of the gallery lies the grub that was the object of her maternal solicitude, the baby for whom she worked day in and day out. She does not recognize it now. She tramples upon it, ignores its presence as if it were only so much clay. It is not recognized for itself; she knows it only when it lies at the end of the gallery to which her doorway leads.

Even when the doorway is obliterated, with the gallery left intact, she recognizes neither the gallery nor the grub at its terminus. Her baby may starve before she will feed it, if either door or hallway is disturbed. She recognizes her offspring only as the grub that lies at the end of an undisturbed gallery leading from a door through which she passes.

COUNTLESS WONDER STORIES

One might wander indefinitely in the realms of insectdom, discovering at every step things that make the most blasé among us pause and ponder.

Parasitism, in which members of one species lay their eggs upon the bodies of other species, or even inject their living young into the bodies of other species; parthenogenesis, in which as many as 94 generations have been produced without the interposition or birth of a single male (page 3); ability to hibernate, in which some individuals have been known to sleep more than forty years and wake up—ten thousand wonder stories might be told of these strange creatures in whose lives is more romance than all the fiction writers in Christendom have been able to conjure up.

For a discussion of specific species and families of insects and their habitats, see pages 28 to 87.

INSECT RIVALS OF THE RAINBOW

IN THE accompanying text pages will be found, in more detail than was possible in the general story, some of the outstanding events in the lives of the insect families represented in the 24 accompanying Color Plates.

A large number of the species portrayed in color come from the Tropics. But family relationships endure beyond geographic boundaries and are more persistent than either color or cut of clothes. So, every brilliant tropical insect has its drab cousins and common family bonds in temperate lands.

The biographies deal broadly with the families and give details that apply to those members most familiar to man in everyday life.

CRICKETS, COCKROACHES, KATYDIDS, AND THEIR KIN

(Order *Orthoptera*)

Plates II and III

This order embraces six families, represented respectively by the short-horned grasshoppers, the crickets, the katydids, the walking sticks, the mantids, and the cockroaches. The individuals of the first three families sing and jump, while those of the latter three are mute and creep. Almost all of the music of the insect world comes from the three singing families of the *Orthoptera*. Indeed, the cicada is the one famous maestro that does not belong to this order.

Short-horned Grasshopper Family (*Acrididae*). The short-horned grasshopper family, distributed all over the world, has about 500 species in the United States. To it belong the Rocky Mountain locust, which in days gone by caused Kansas to be known as the "hopper" State, the Argentine locust, which frequently descends upon the pampa from the foothills of the Andes and eats everything bare before it, the locust that was among the Plagues of Pharaoh, and that other one which figured in the diet of "locusts and wild honey" mentioned in the Bible.

The life histories of most of the short-horned grasshopper and locust species show little variation. The females deposit their eggs in small oval, or bean-shaped packets, either in the soil, at the base of the stems of grasses, or in soft wood. The fall-deposited eggs do not hatch until spring.

The species reproduced are: Autumn Yellow Winged Grasshopper (*Arphia xanthoptera* Burm. Plate II, figure 1), occurring in the northeastern United States in autumn; African Grasshopper (*Atractomorpha aberrans* Karsch. Plate II, figure 2), coming from central Africa; Eastern Lubber Grasshopper (*Romalea microptera* Palis. Plate II, figure 6), occurring in the hay fields of southeastern United States; Yellow Winged Grasshopper (*Arphia simplex* Scudd. Plate III, figure 2), habitat the Mississippi Valley; European Grasshopper (*Monachidium lunus* Joh. Plate III, figure 4), occurring alike in Europe, Asia, and Africa; Desert Grasshopper (*Leprus cyaneus* Cockerell. Plate III, figure 6), habitat the arid areas of southwestern United States; Old World Migratory Locust (*Locusta migratoria* Linn. Plate III, figure 7), occurring in Europe.

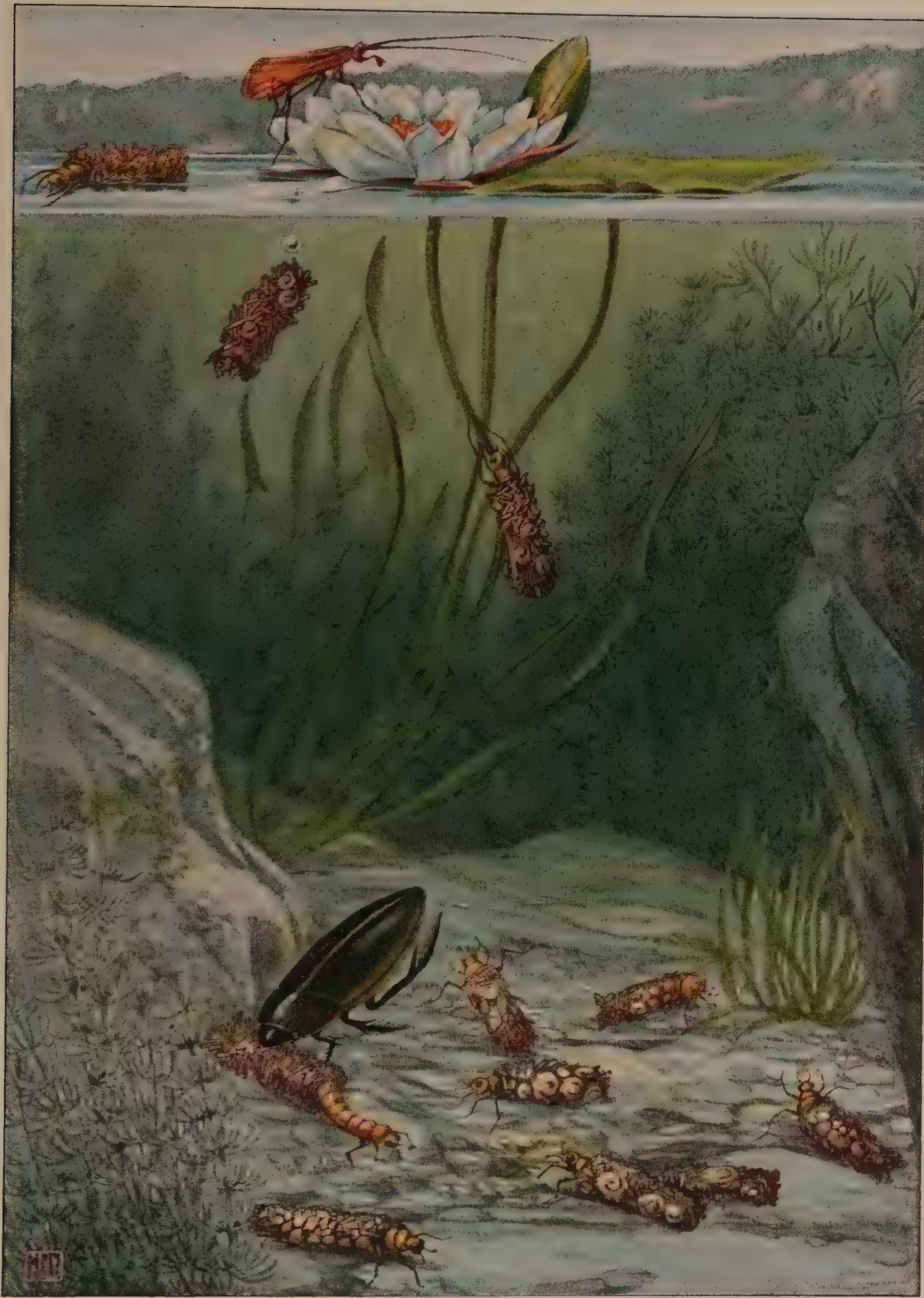
Walking Stick Family (*Phasmidae*). This bizarre group, some of whose members disguise themselves by simulating twigs and leaves, contains about 600 species, mainly tropical. Sixteen species are native American, the most familiar being the walking stick or devil's darning-needle. The eggs, one-eighth of an inch long, of polished black, with a whitish stripe on one side, are scattered on the ground in the fall, where they lie until the warm days of spring. The female, unlike most Orthopters, makes no provision for their safety. If certain species of walking sticks lose a leg another grows in its place.

The species reproduced is: Walking Leaf (*Pulchriphyllium bioculatum* Gray. Plate II, figure 3), habitat African coast.

Mantis Family (*Mantidae*). The mantids are a carnivorous tropical tribe, with many species having wings resembling the leaves of plants, both in coloring and formation. Perhaps a score of species are found in the South, one of them extending its habitat as far north as Maryland and Indiana. The egg cases approximate the size and shape of an almond, and the color of golden grain, the substance of which they are made being akin to silk—a frothy mass whipped until it turns to a foam and hardens.

It has been remarked that although the attitude the mantis assumes may seem to be that of devotion, such sanctimonious airs are a mask of evil habits; "those arms folded in prayer are cutthroat weapons; they tell no beads, they slay whatever passes within range." At the sight of one of the more formidable kinds of prey the mantis gives a convulsive shiver, strikes a terrifying pose, spreads its wings, curls the tip of its abdomen, and, standing firmly on four hind legs, holds the forward part of its body upright, with forelegs forming a cross. The victim comes within range, the forelegs fall, the claws strike, and the saws clutch the prey. The wretched victim writhes with pain, chews space with its mandibles, and helplessly kicks the air. The mantids are friends of man because they live so largely on insects that are destructive to crops (see, also, page 20).

The species reproduced is: Chinese Mantis (*Tenodera sinensis* Sauss. Plate II, figure 4), an immigrant from China.



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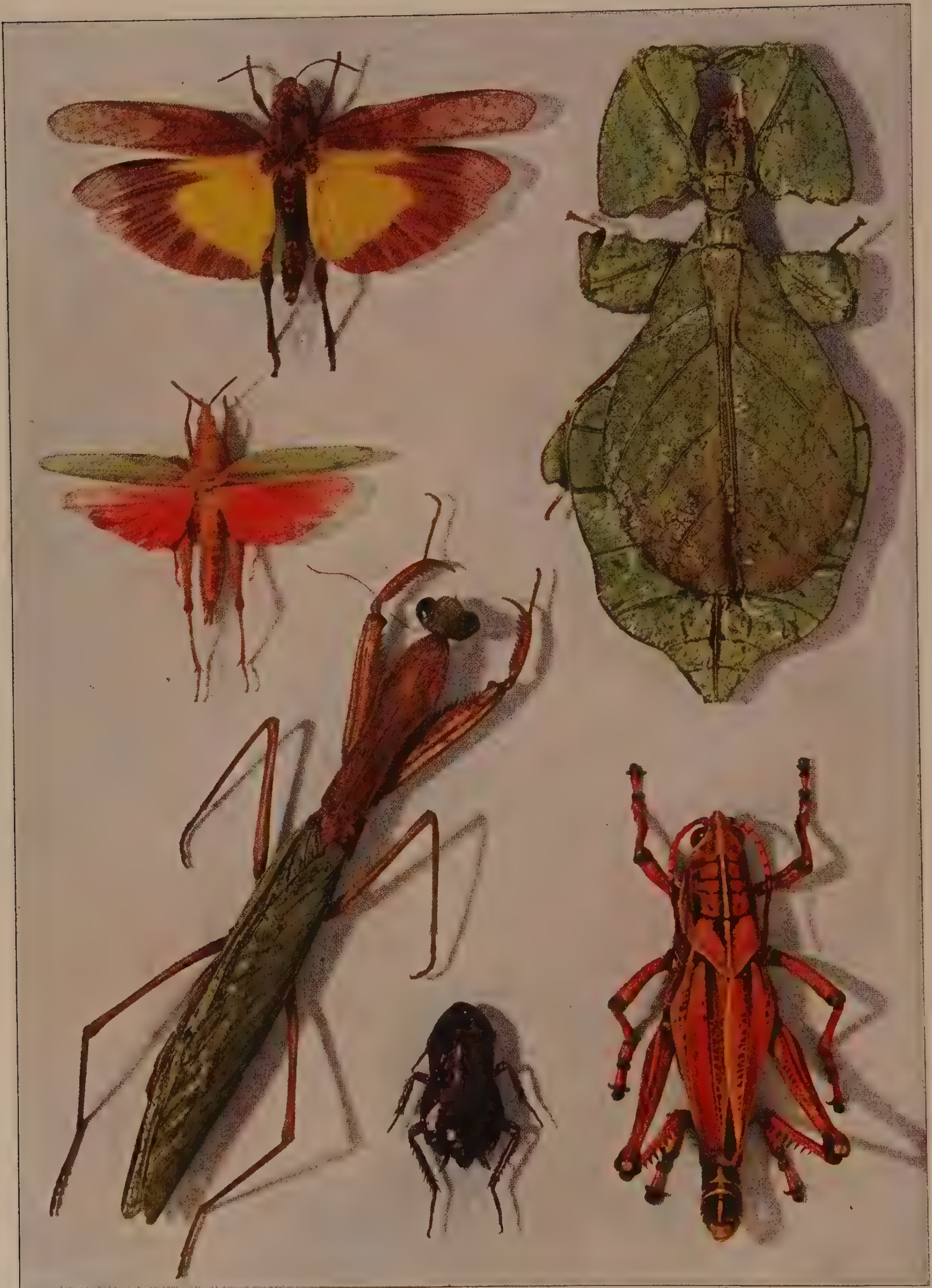
Painting by Hashime Murayama, after Paul Mëry

SURPRISING EVENTS IN THE LIVES OF CADDIS-FLIES

Airy mannered, filmy winged, and long antennaed, one would hardly suspect the gentle creature perched on the lily as being the mother of the insectean inventor of the first submarine. She drops her eggs on the river bottom. These hatch, and the little wigglers build themselves cases of fiber and pebbles, which they line with silk. In these they can rise or sink at will. The diving beetle preys upon them as shown. The caddis-fly illustrated belongs to the family *Limnophilidae*, and the diving beetle to the family *Hydrophilidae*. The insects illustrated are natural size.



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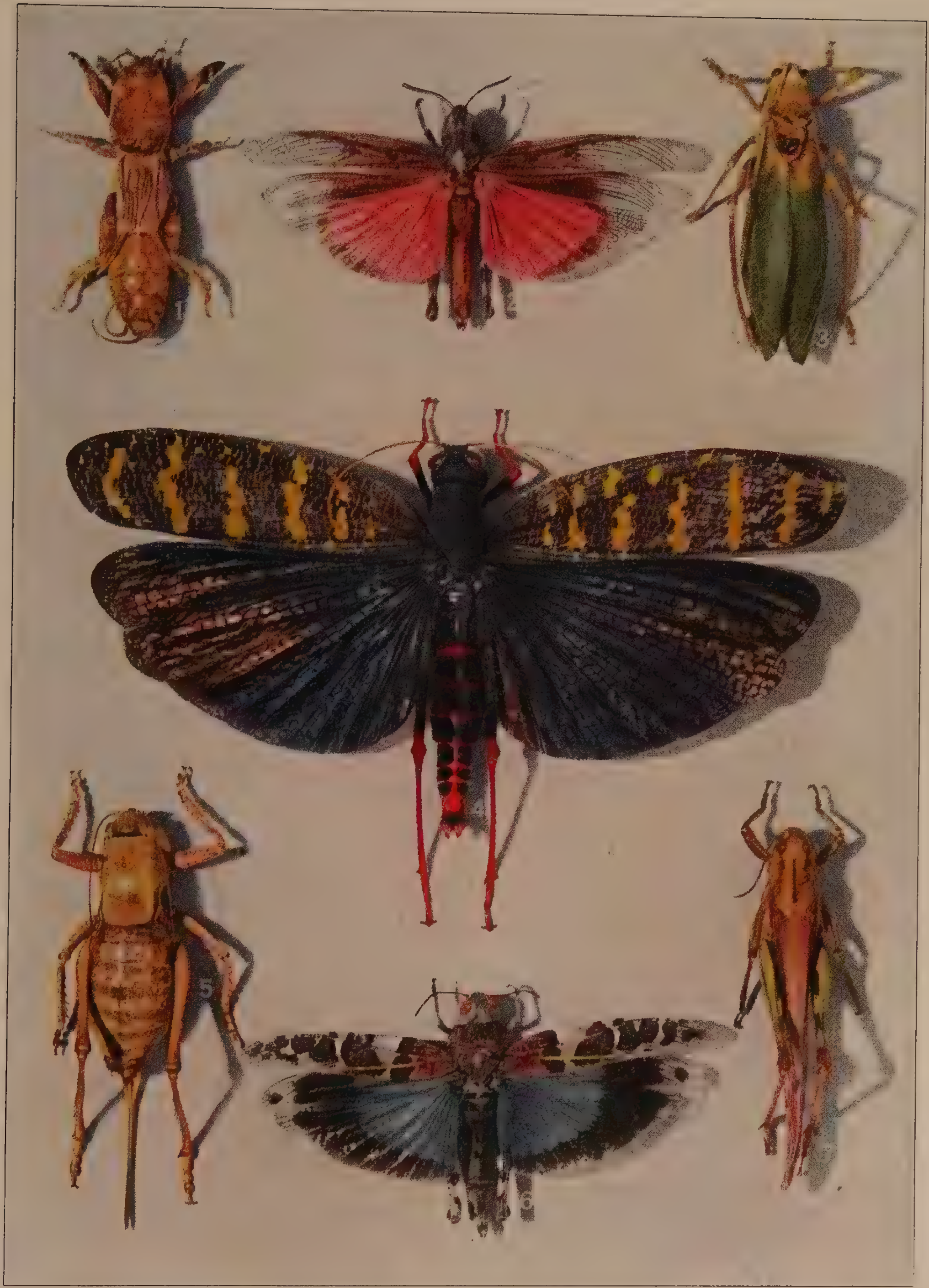
Natural Size

A GROUP OF GRASSHOPPERS AND THEIR CONTRASTING KIN

(1) Autumn Yellow Winged Grasshopper, *Arphia xanthoptera* Burm. [Female]; (2) African Grasshopper, *Atractomorpha aberrans* Karsch [Female]; (3) Walking Leaf, *Pulchriphyllium bioculatum* Gray [Female]; (4) Chinese Mantis, *Tenodera sinensis* Sauss. [Female]; (5) Oriental Cockroach, *Blatta orientalis* Linn. [Female]; (6) Eastern Lubber Grasshopper, *Romalea microptera* Palis. [Male]. See text under the following Family headings: Short-horned Grasshopper, Walking Stick, and Mantis.



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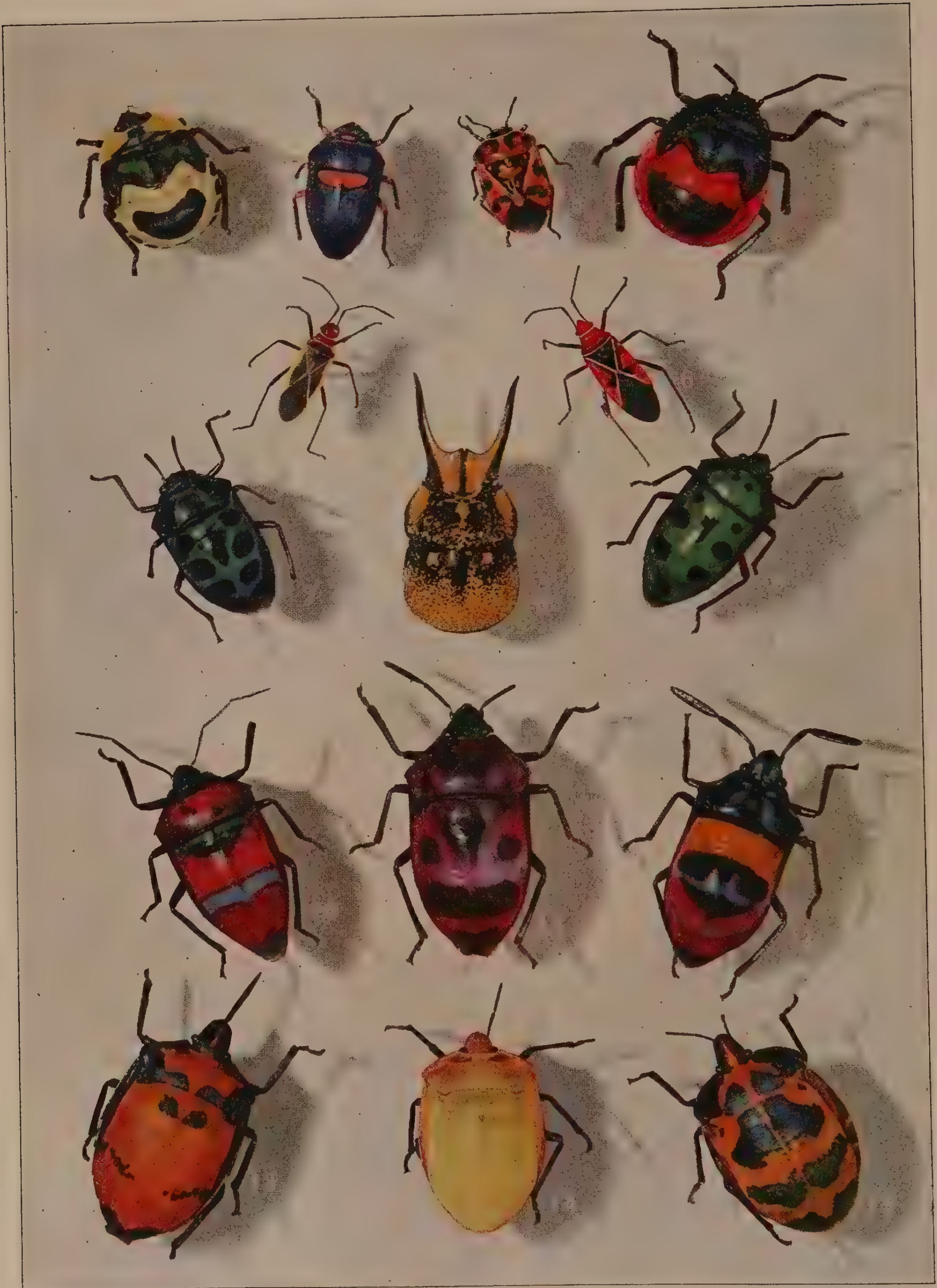
Natural Size

THE MOLE-CRICKET, THE TRUE KATYDID, AND SOME OF THEIR COUSINS

(1) European Mole-cricket, *Gryllotalpa gryllotalpa* Linn. [Female]; (2) Yellow Winged Grasshopper, *Arphia simplex* Scudd. [Female]; (3) True Katydid, *Pterophylla camellifolia* Fab. [Male]; (4) European Grasshopper, *Monachidium lunus* Joh. [Female]; (5) Mormon Cricket, *Anabrus simplex* Hald. [Female]; (6) Desert Grasshopper, *Leprus cyaneus* Cockerell [Female]; (7) Old World Migratory Locust, *Locusta migratoria* Linn. [Male]. See text under the following Family headings: Cockroach, Cricket, and Long-horned Grasshopper.



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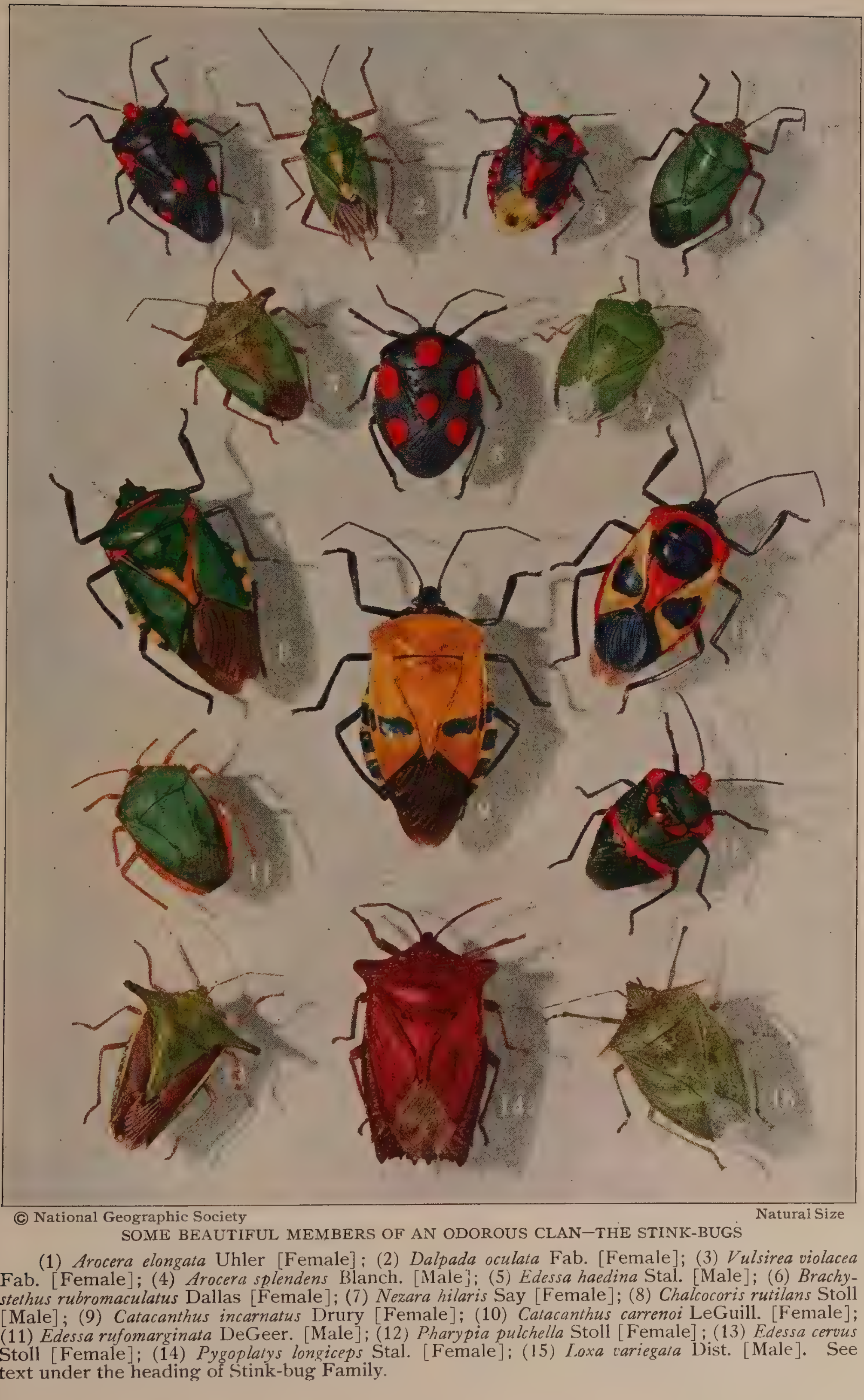
1⅜ times Natural Size

A PLATE OF HEMIPTEROUS JEWELS GATHERED FROM THE ENDS OF THE EARTH

(1) Nymph of *Poecilocoris druraei* Linn.; (2) *Philia senator* Fab. [Female]; (3) Harlequin Cabbage-bug, *Murgantia histrionica* Hahn [Female]; (4) Nymph of *Poecilocoris nepalensis* H-S.; (5) *Dysdercus mimus* Say [Male]; (6) *Dysdercus andreae* Linn. [Male]; (7) *Chrysocoris bilunulatus* Vollen. [Female]; (8) *Ceratocoris bucephalus* White [Male]; (9) *Calliphara nobilis* Linn. [Female]; (10) *Calliphara excellens* Burm. [Female]; (11) *Chrysocoris grandis* Thumb. [Female]; (12) *Chrysocoris sellatus* White [Female]; (13) *Tectocoris diopthalmus* var. *schonherri* Esch. [Female]; (14) *Tectocoris diopthalmus* var. *cyanipes* Fab. [Female]; (15) *Tectocoris peregrina* Kirk. [Female]. See text under the following Family headings: Shield-bug, Stink-bug, Cotton-stainer, and Burrowing-bug.



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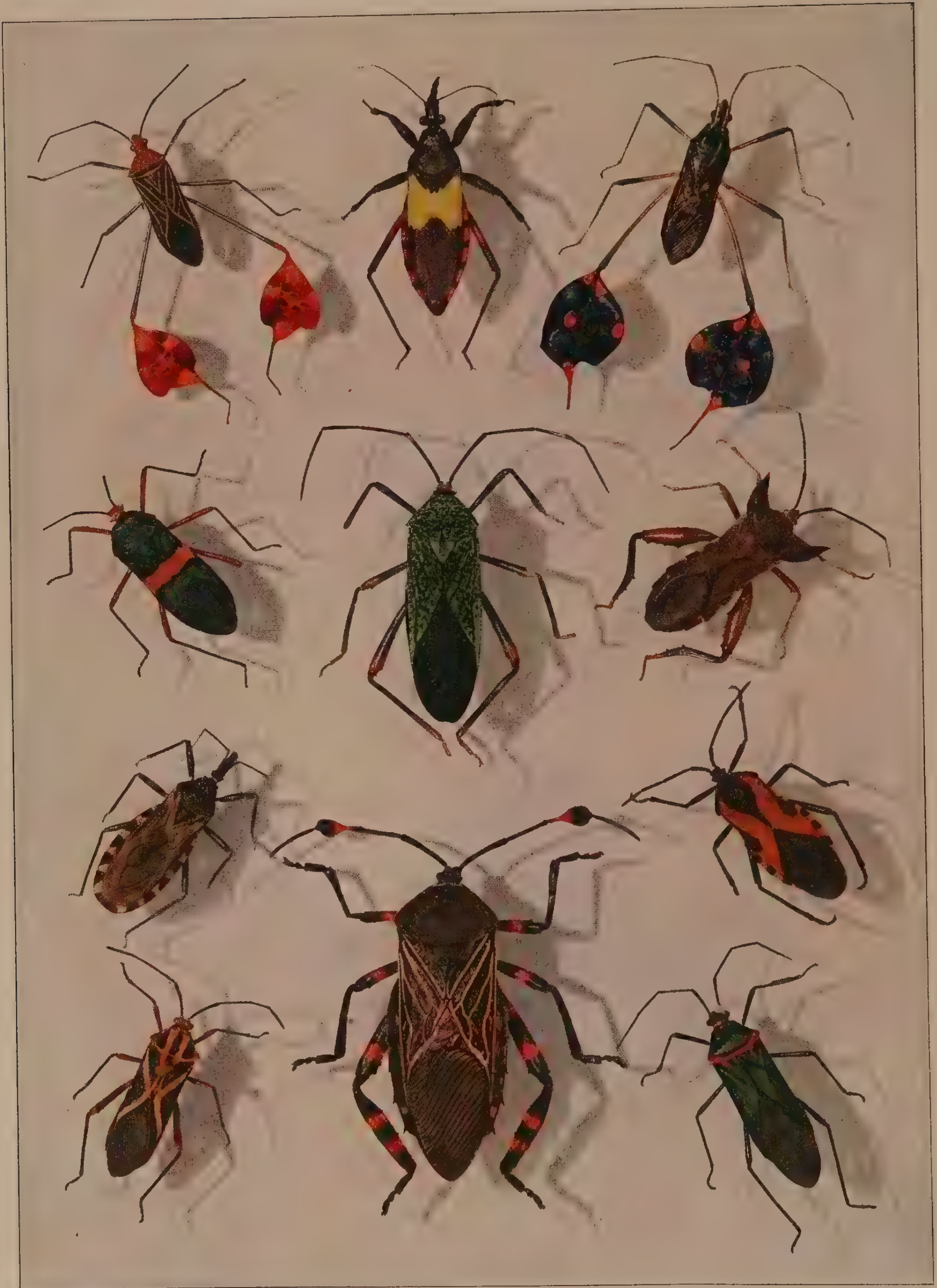
Natural Size

SOME BEAUTIFUL MEMBERS OF AN ODOROUS CLAN—THE STINK-BUGS

(1) *Arocera elongata* Uhler [Female]; (2) *Dalpada oculata* Fab. [Female]; (3) *Vulsirea violacea* Fab. [Female]; (4) *Arocera splendens* Blanch. [Male]; (5) *Edessa haedina* Stal. [Male]; (6) *Brachystethus rubromaculatus* Dallas [Female]; (7) *Nezara hilaris* Say [Female]; (8) *Chalcocoris rutilans* Stoll [Male]; (9) *Catacanthus incarnatus* Drury [Female]; (10) *Catacanthus carrenoi* LeGuill. [Female]; (11) *Edessa rufomarginata* DeGeer. [Male]; (12) *Pharypia pulchella* Stoll [Female]; (13) *Edessa cervus* Stoll [Female]; (14) *Pygoplatys longiceps* Stal. [Female]; (15) *Loxa variegata* Dist. [Male]. See text under the heading of Stink-bug Family.



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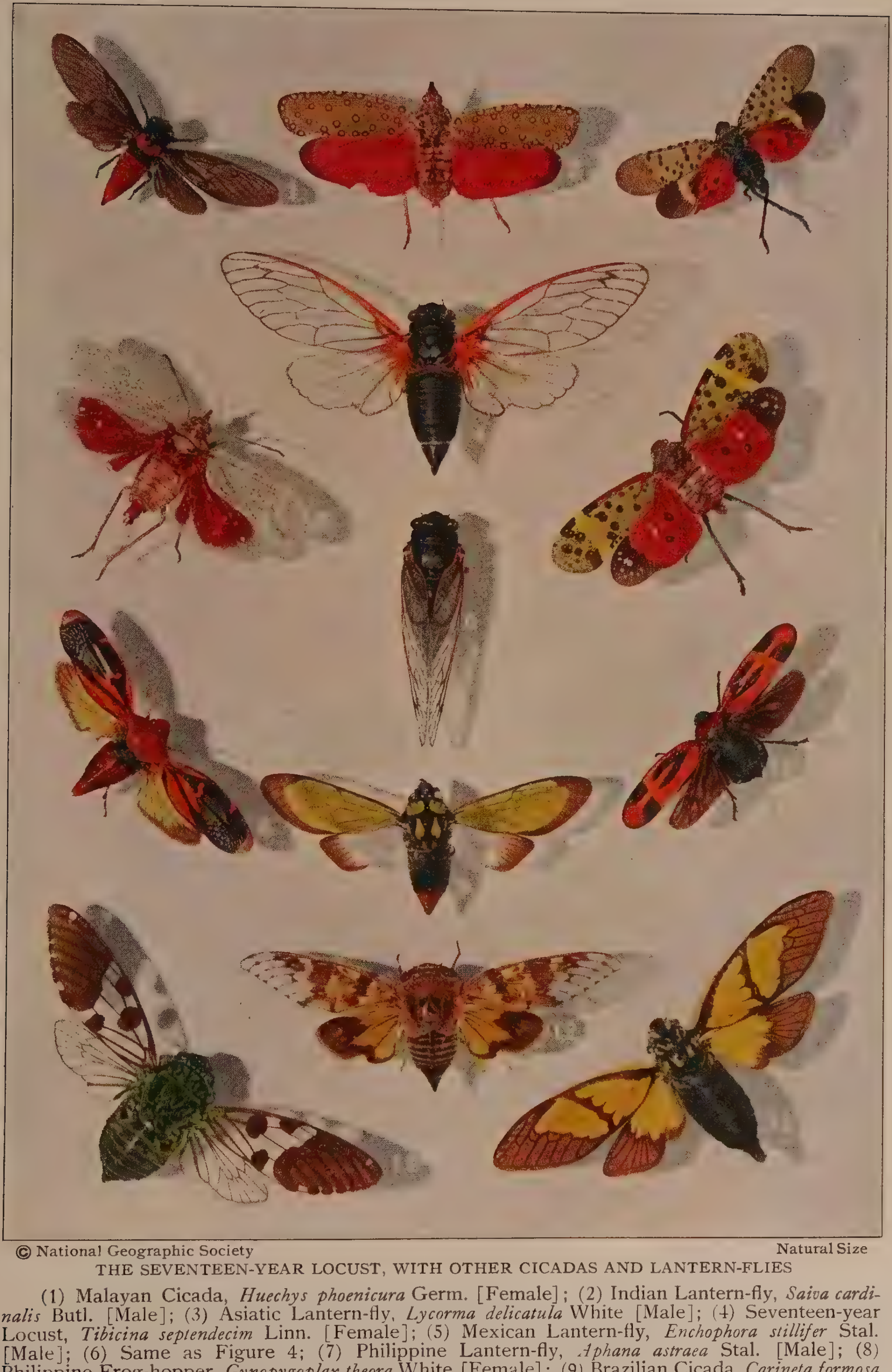
Natural Size

ASSASSIN-BUGS AND SQUASH-BUGS THAT BELIE THEIR NAMES

(1) *Anisosceles hymeniphera* Westwood [Female]; (2) *Microtomus purcis* Drury [Male]; (3) *Diactor bilineatus* Fab. [Male]; (4) *Paryphes laetus* Fab. [Female]; (5) *Mictis metallica* Sign. [Female]; (6) *Mozena lunata* Burm. [Male]; (7) *Triatoma infestans* Klug [Male]; (8) *Sephina vinula* Stal. [Male]; (9) *Machtima mexicana* Stal. [Female]; (10) *Thasus gigas* Burm. [Male]; (11) *Sphictyrtus longirostris* Dist. [Female]. See text under the following Family headings: Squash-bug and Assassin-bug. To the Assassin-bug Family belong two species which figured prominently in the news of several decades ago. They were called the kissing bugs and their reputation spread so far and wide that wherever anyone was bitten by an insect of any kind the inference was that he or she had been the victim of an attack by one of the Assassins.



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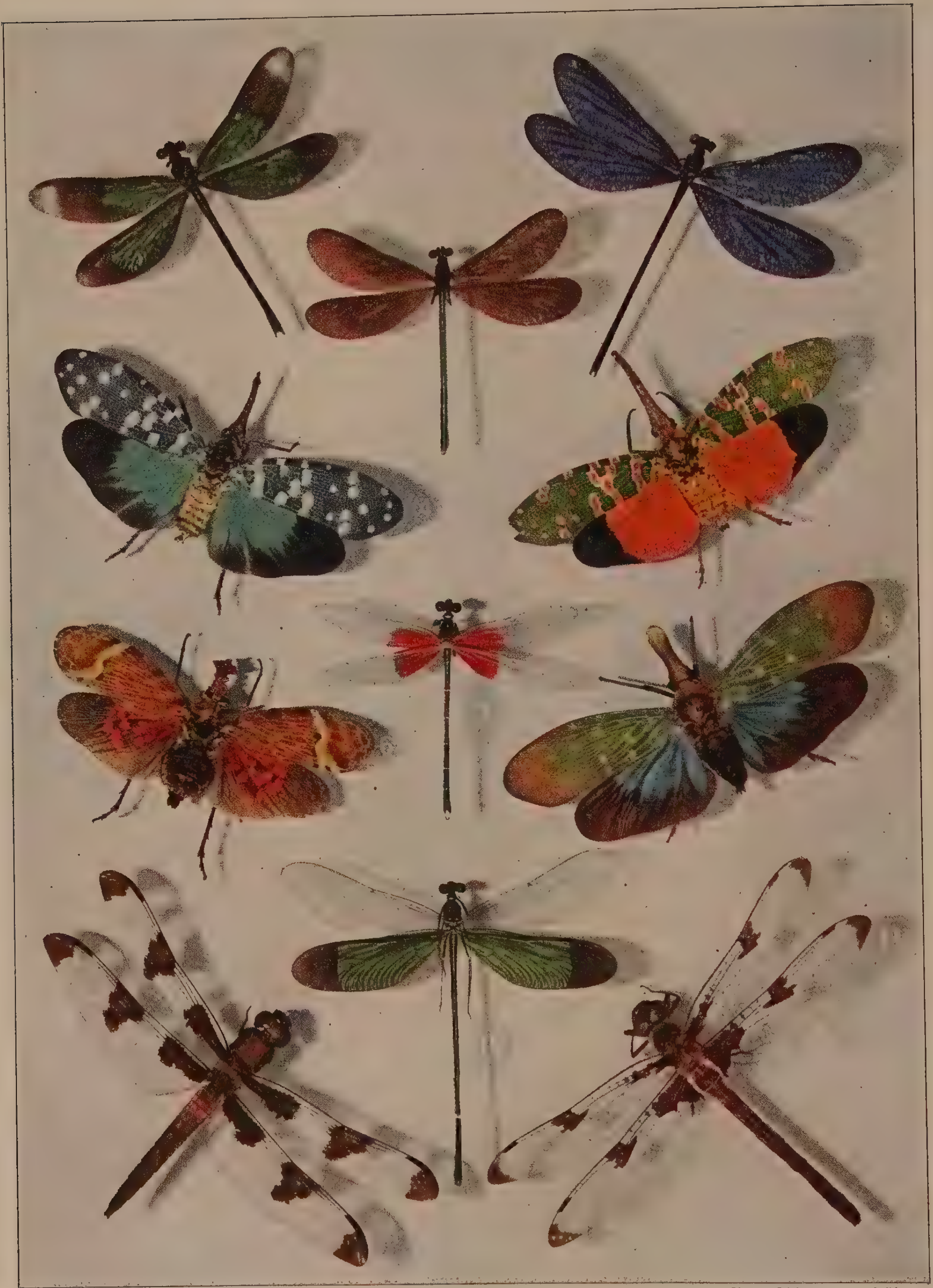
Natural Size

THE SEVENTEEN-YEAR LOCUST, WITH OTHER CICADAS AND LANTERN-FLIES

(1) Malayan Cicada, *Huechys phoenicura* Germ. [Female]; (2) Indian Lantern-fly, *Saiva cardinalis* Butl. [Male]; (3) Asiatic Lantern-fly, *Lycorma delicatula* White [Male]; (4) Seventeen-year Locust, *Tibicina septendecim* Linn. [Female]; (5) Mexican Lantern-fly, *Enchophora stillifer* Stal. [Male]; (6) Same as Figure 4; (7) Philippine Lantern-fly, *Aphana astraea* Stal. [Male]; (8) Philippine Frog-hopper, *Gynopygoplax theora* White [Female]; (9) Brazilian Cicada, *Carineta formosa* Germ. [Male]; (10) Brazilian Frog-hopper, *Tomaspis furcata* Germ. [Female]; (11) Mexican Cicada, *Zammara calochroma* Walk. [Male]; (12) Javanese Cicada, *Platypleura fulvigera* Walk. [Female]; (13) Indian Cicada, *Gaeana sulphurea* Hope [Male]. See text under the following Family headings: Cicada, Lantern-fly, and Frog-hopper.



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Four-fifths Natural Size

ANIMATED PURSUIT PLANES AND WINGED CLOWNS OF THE INSECT WORLD

(1) Philippine Damsel-fly, *Pseudophaea refulgens* Selys; (2) Black-wing Damsel-fly, *Agrion maculatum* Beauv.; (3) *Vestalis melania* Selys; (4) *Fulgora maculata* Olivier [Male]; (5) Chinese Candle Fly, *Fulgora candelaria* Fab. [Male]; (6) Panama Lantern-fly, *Phrictus tripunctata* Dist. [Male]; (7) Ruby-spot, *Hetaerina americana* Fab. [Male]; (8) Duck Billed Lantern-fly, *Fulgora samarana* Baker [Female]; (9) Ten Spot Skimmer, *Libellula pulchella* Drury; (10) *Neurobasis chinensis* Linn.; (11) Water-prince, *Epicordulia princeps* Hagen. The pursuit planes belong to the Dragon-fly and True Damsel-fly Families and the clowns to the Lantern-fly Family. See text under these Family headings.

Cockroach Family (*Blattidae*). Though a thousand species of cockroaches have been described, most of them inhabit tropical countries; only 43 exist north of the Rio Grande River, these usually being found in fields and woods under sticks, stones, and other rubbish. The two major pests are the Oriental Cockroach and the croton bug, both of which came from foreign parts, the former from China and the latter from Europe. Tramp steamers sometimes come into port, after sailing the seven seas, with their sailors wearing gloves when asleep, to save the nails of their hands from being gnawed off by the cockroaches.

Almost any sort of dry organic matter—paste from bookbindings or wall paper, dry bread or leather scrapings, the products of milady's larder or their own egg cases—is "beer and skittles" to the cockroach palate.

The female lays her eggs in a purselike, brown case of horny material, usually about 16 eggs in two rows, arranged so that when the young hatch, each rank will face the other. The mother cockroach, as a rule, carries the egg case with her until the babies are ready to emerge, when she assists them by tearing it open. The young ones are able, as soon as they hatch, to go about without asking odds from anybody, eating the same food as their elders enjoy. They mature in about a year, casting off a number of outgrown suits before becoming adults.

The species reproduced is: Oriental Cockroach (*Blatta orientalis* Linn. Plate II, figure 5), found in many countries.

Cricket Family (*Gryllidae*). Most of the true crickets, which belong to the Gryllid family, have developed a fondness for living close to man, and the cheery calls of the Gryllid Romeos to their Juliets are familiar sounds. They are omnivorous eaters, most species spending the day in some dark cranny and going abroad to seek their prey at night. Some species are day hunters, however. The mole-cricket leads a burrowing life, usually in damp earth. The female deposits from 200 to 300 eggs in masses of from 40 to 60. She is one of the few nonsocial insects that look after their eggs until they hatch and then feed their young until the latter are able to shift for themselves. She has to keep a sharp eye on Mr. Mole-cricket, for he does not hesitate to eat his own children when he can get hold of them.

The species reproduced is: European Mole-cricket (*Gryllotalpa gryllotalpa* Linn. Plate III, figure 1), introduced into the United States from the Old World.

Long-horned Grasshopper Family (*Tettigoniidae*). Most of the older authorities call this family the *Locustidae*. It embraces the katydids, the meadow grasshoppers, the camel crickets, the sword bearing crickets, the western crickets, and the Jerusalem crickets.

The species reproduced are: True Katydid (*Pterophylla camellifolia* Fab. Plate III, figure 3), occurring in eastern United States; Mormon Cricket (*Anabrus simplex* Hald. Plate III, figure 5), habitat western United States.

THE BUGS AND CICADAS AND THEIR RELATIVES

(Order *Hemiptera*)

Plates IV to VIII

This order is one of the most versatile in habit and form. While many recent authorities subdivide it into several groups, the more conservative older classification is used by many museums.

The group embraces about 5,000 American species, including plant-lice, scale-insects, and mealy wings; cicadas, lantern-flies, tree- and leaf-hoppers, and spittle-insects; water- boatmen, striders, and scorpions; ambush-bugs, assassin-bugs, stink-bugs, and many others.

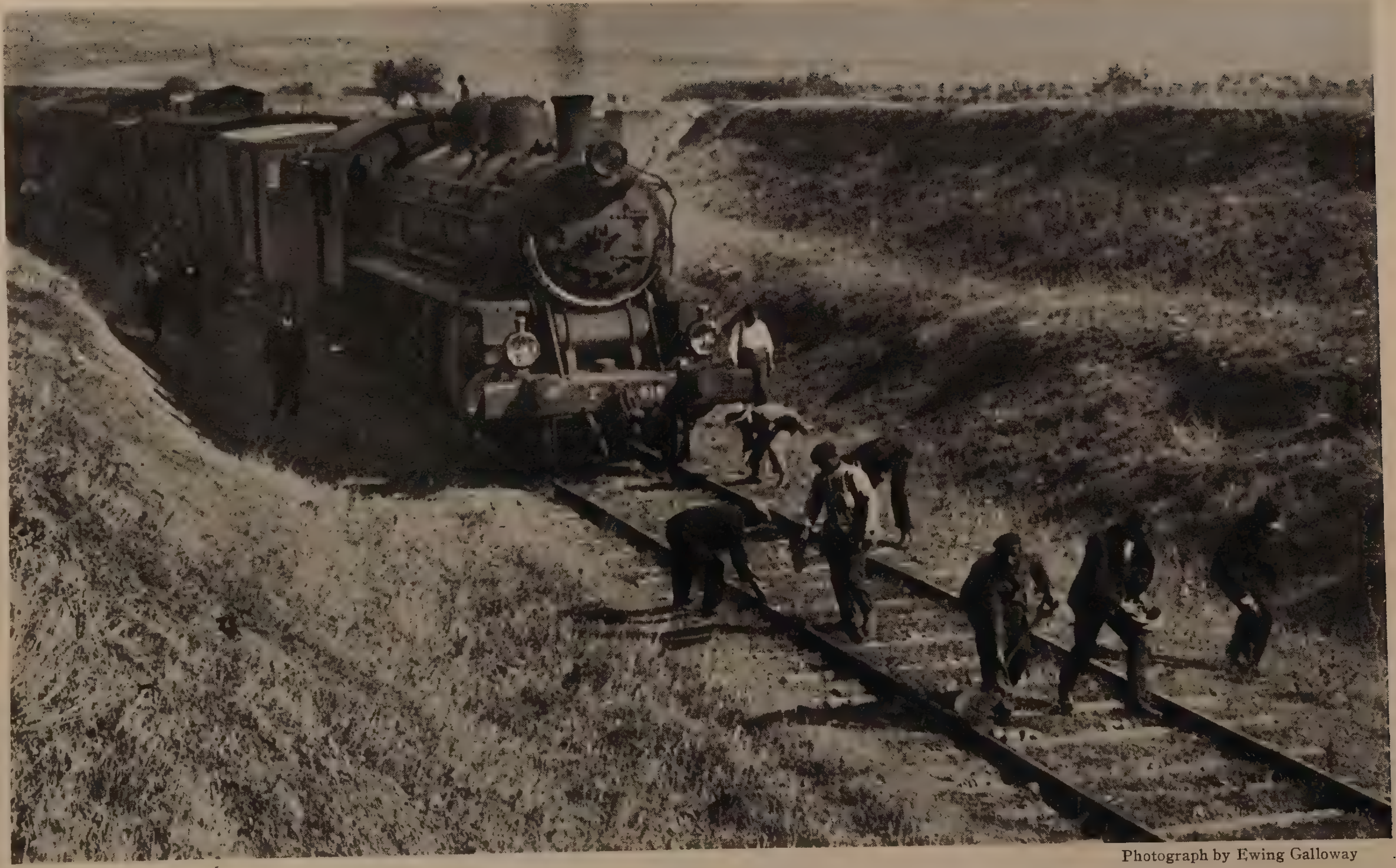
Some of the remarkable families not shown because of the minuteness of their members are those which produce plant galls. Typical of these are the sucking bugs of the plant-louse type, which produce the twig gall of the hickory and the root gall of the grape. Another is the family to which belongs the San José scale. The males of some species of this family are mouthless and so have a very brief existence. The females become both footless and blind after settling down.

Statisticians have estimated that leaf-hoppers, by sucking the sap, probably destroy one-fourth of all the grass that grows and that a million of them will kill as much forage as a cow can eat.

Shield-bug Family (*Scutelleridae*). The shield-bugs constitute an attractive clan, of which some 25 American species have been described. None of the latter occurs in sufficient numbers to be of economic importance.

The species reproduced are: Nymph of *Poecilocoris druraei* Linn. (Plate IV, figure 1), occurring in India and China; *Philia senator* Fab. (Plate IV, figure 2), occurring in Australia and Malaysia; Nymph of *Poecilocoris nepalensis* H-S. (Plate IV, figure 4), occurring in India and China; *Chrysocoris bilunulatus* Vollen. (Plate IV, figure 7), a native of Sumatra; *Calliphara nobilis* Linn. (Plate IV, figure 9), habitat southeastern Asia; *Calliphara excellens* Burm. (Plate IV, figure 10), occurring in southeastern Asia; *Chrysocoris grandis* Thumb. (Plate IV, figure 11), habitat China, Japan, and India; *Chrysocoris sellatus* White. (Plate IV, figure 12), a native of the Philippines; *Tectocoris diopthalmus* var. *schonherri* Esch. (Plate IV, figure 13), habitat extending from the coast of China to that of Australia; *Tectocoris diopthalmus* var. *cyanipes* Fab. (Plate IV, figure 14), a native of Java; *Tectocoris peregrina* Kirk. (Plate IV, figure 15), inhabiting the lands that border the Indian Ocean.

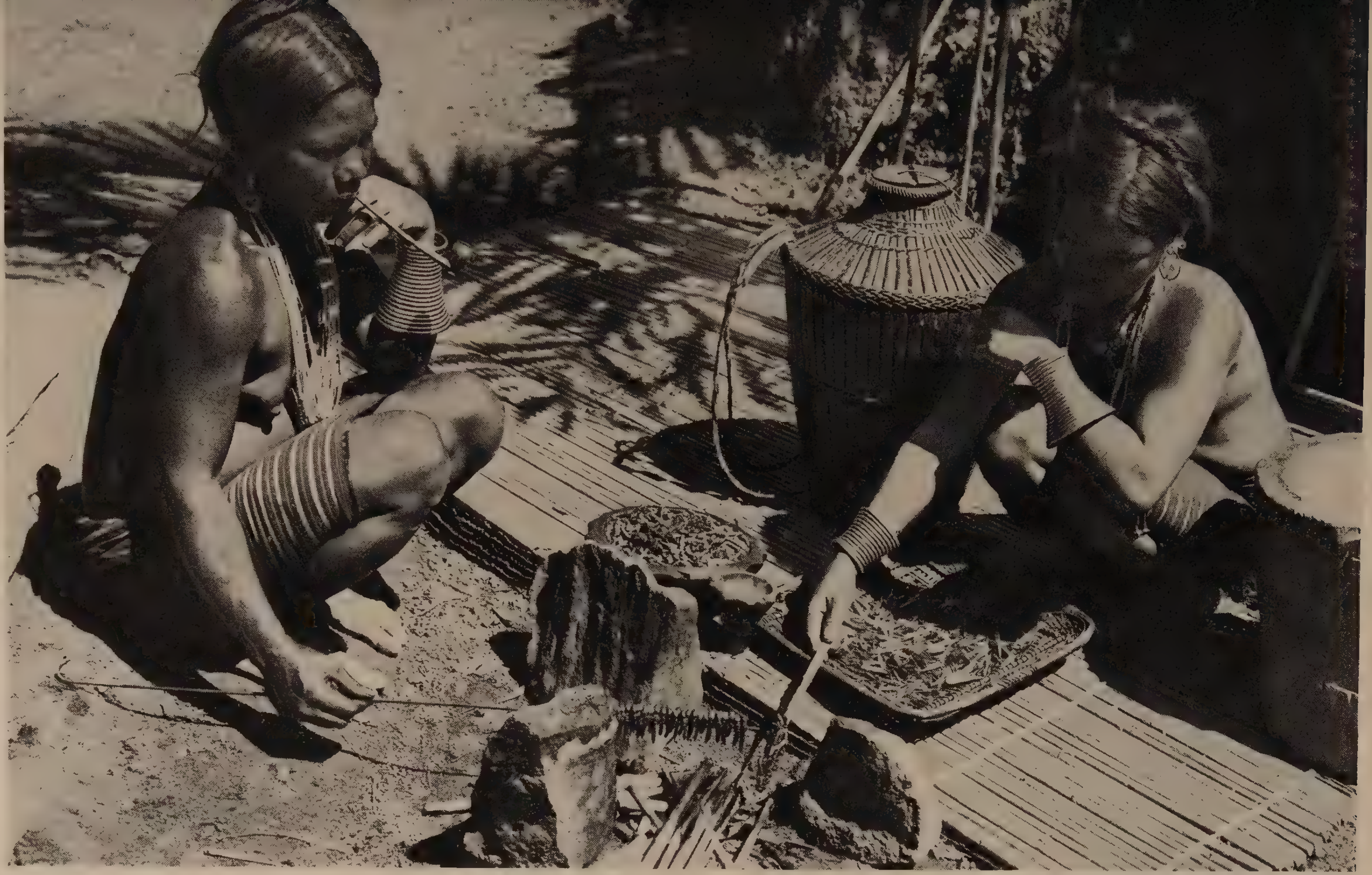
Stink-bug Family (*Pentatomidae*). This family comprises some 4,000 species, about 300 occurring in the United States. Most species



Photograph by Ewing Galloway

LOCUSTS HOLD UP A FREIGHT TRAIN ON THE ATHENS-SALONIKI LINE

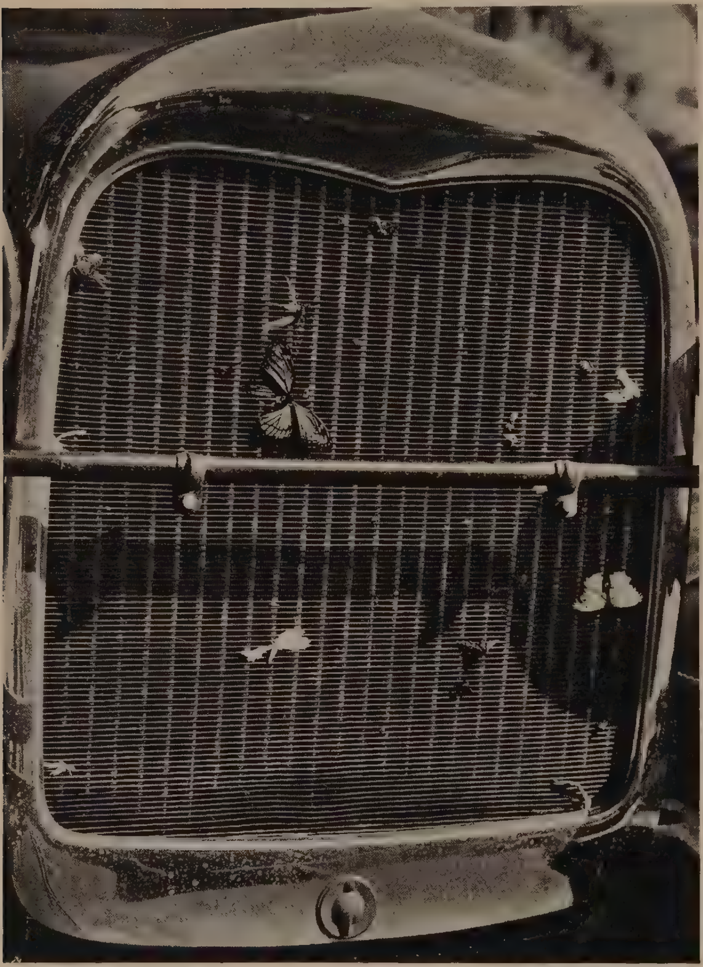
The locusts that plagued Egypt in Bible times, the ones that figure periodically in the devastation of Palestine, those that made Kansas the "hopper" State some decades ago, and those which from time to time descend on the Argentine pampa and transform luxuriant vegetation into a desert waste, are all of a pattern. They belong to the short-horned grasshopper family. A train cannot get traction on rails that have been "soaped" with the crushed



Photograph by Charles Martin

LOCUSTS AND WILD HONEY STILL REMAIN FOOD ITEMS AMONG PRIMITIVE PEOPLE

Ifugao women in Luzon, Philippine Islands, prepare locusts for food by roasting them. Such rich feasts often cause indigestion. According to Mosaic law (Leviticus 11, 22), the Children of Israel were permitted to eat "the locust after his kind, and the beetle after his kind, and the grasshopper after his kind." Flies and fly eggs are made into cakes by some Indian tribes in Mexico, and some species of beetles are used to put more "kick" in certain types of alcoholic beverages drunk by other tribes in the same country (see text, page 9).



Photograph by Clifton Adams

AN ILLUSTRATION OF ONE OF THE MEANS BY WHICH INJURIOUS INSECTS MAY BE DISTRIBUTED BY MAN UNWITTINGLY

Several insects occurring in south Florida caught in the radiator of an automobile. Some flew into the path of the car and some were drawn in by the draft of the motor-cooling fan.

are plant feeders, but not a few are omnivorous. Several of the more common American stink-bugs are green, like the large green tree bug and the bound tree bug; other common species are brown.

A few of the American species are as bizarre in their dress as a clown, and it is this character of its coat that gives to one of our worst pests, the Harlequin Cabbage-bug, its everyday name. That insect also might be regarded as the beer bug, for its eggs, neatly arranged in groups of twelve, six in a row, look like a group of miniature beer kegs, even down to the hoops and the bung.

The species reproduced are: Harlequin Cabbage-bug (*Murgantia histrionica* Hahn. Plate IV, figure 3), habitat United States; *Arocera elongata* Uhler. (Plate V, figure 1), habitat Brazil; *Dalpada oculata* Fab. (Plate V, figure 2), occurring in India, China, and Japan; *Vulsirea violacea* Fab. (Plate V, figure 3), ranging from Mexico to Brazil; *Arocera splendens* Blanch. (Plate V, figure 4), native of Central America and the northern part of South America; *Edessa haedina* Stal. (Plate V, figure 5), native of Mexico; *Brachystethus rubromaculatus* Dallas. (Plate V, figure 6), inhabiting Central America and Mexico; *Nezara hilaris* Say. (Plate V, figure 7), occurring in the United States; *Chalcocoris rutilans* Stoll. (Plate V, figure 8), habitat Africa; *Catacanthus incarnatus* Drury. (Plate V, figure 9), occurring in Japan, China, and Borneo; *Catacanthus carrenoi LeGuill.* (Plate V, figure 10), a native of the Philippines; *Edessa rufomarginata* DeGeer. (Plate V, figure 11), ranging from Mexico to the Argentine; *Pharypia pulchella* Stoll. (Plate V, figure 12), ranging from Mexico south to Brazil; *Edessa cervus* Stoll. (Plate V, figure 13), habitat Brazil to northern South America; *Pygoplatys longiceps* Stal. (Plate V, figure 14), occurring in the Philippines; *Loxa variegata* Dist. (Plate V, figure 15), occurring in Costa Rica and Panama.

Cotton-stainer Family (*Pyrrhocoridae*). This family is represented in our fauna by 22 species, which sometimes are known as red-bugs. The cotton-stainers do much damage by piercing cotton stems and bolls with their beaks and sucking the sap. Their principal damage, however, comes from the staining of the cotton in its open boll by the insects' excretions. Some species attack oranges, puncturing the skin and thereby causing the fruit to decay and fall to the ground.

The species reproduced are: *Dysdercus mimus* Say. (Plate IV, figure 5), occurring in the South; *Dysdercus andreae* Linn. (Plate IV, figure 6), occurring in Florida and the West Indies.

Burrowing-bug Family (*Cydnidae*). Twenty-nine species of this family now are listed in the United States. Their front legs are more or less flattened and fitted for digging, and they are found burrowing in sandy places and under sticks and stones. It is thought that they feed by sucking the sap from plant roots.

The species reproduced is: *Ceratocoris bucephalus*, White. (Plate IV, figure 8), habitat southeastern Asia.

Squash-bug Family (*Coreidae*). This family consists of some 1,500 known species, of which 200 are American. The familiar squash-bug is its most widely known representative. To it also belong the box elder bug, which sucks the sap of the box elder and in adulthood resembles a giant bed-bug, and the cherry bug, which imbibes the juice of the cherry.

Some of the squash-bugs are queer-looking "critters." One has its wing cases higher at the sides than at the middle, thus producing a sort of hopper with a series of spines around the edge. In this the male has to carry the family eggs, but he accepts his task only after his spouse has henpecked him to a point where he sees that opposition is useless.

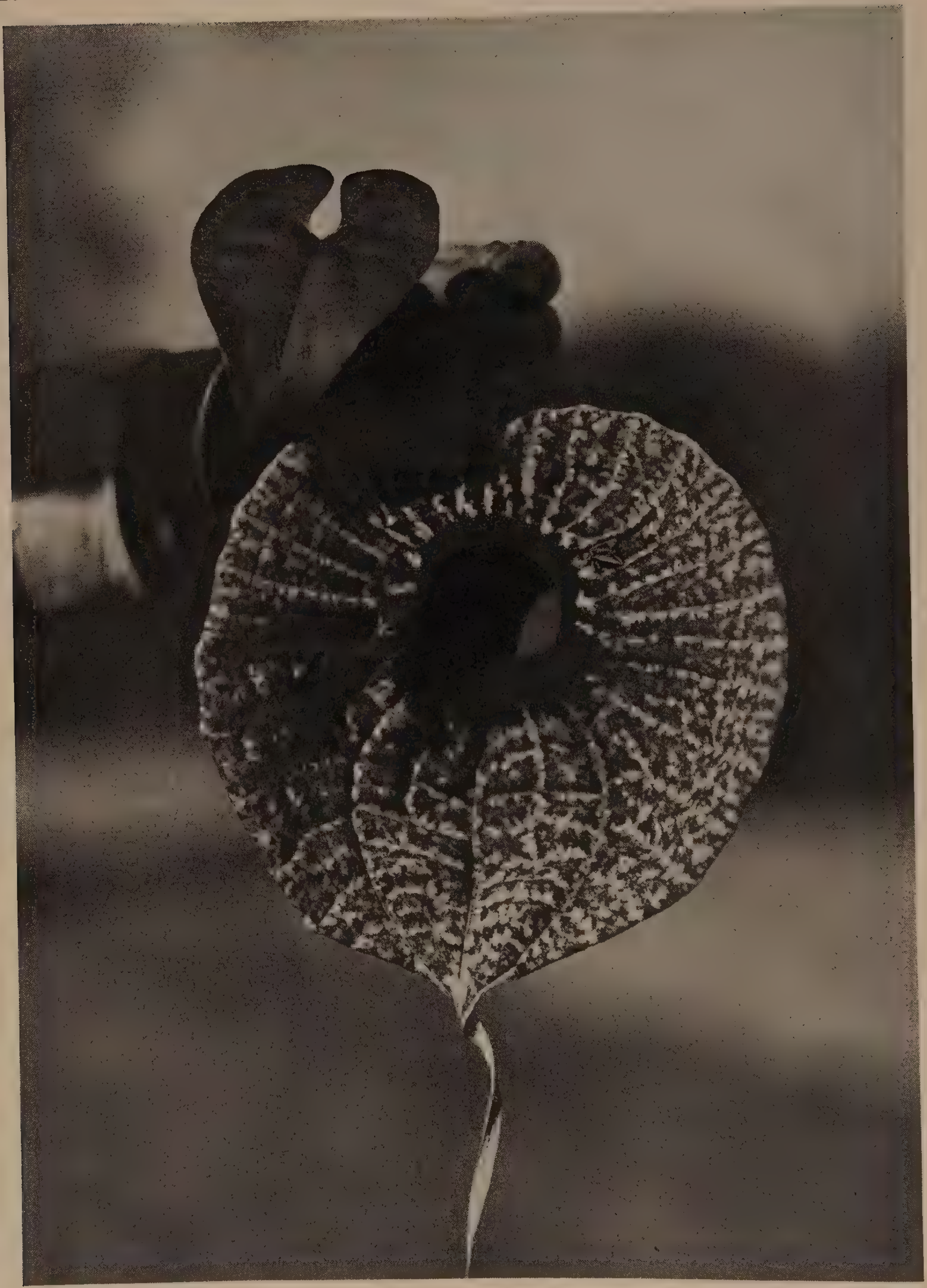
The species reproduced are: *Anisosceles hymeniphera* Westwood. (Plate VI, figure 1), found in Mexico; *Diactor bilineatus* Fab. (Plate VI, figure 3), inhabiting northern South America; *Paryphes laetus* Fab. (Plate VI, figure 4), occurring throughout South America; *Mictis metallica* Sign. (Plate VI, figure 5), native of Africa; *Mozena lunata* Burm. (Plate VI, figure 6), ranging from Texas to Central America; *Sephina vinula* Stal. (Plate VI, figure 8), inhabiting Mexico; *Machtima mexicana* Stal. (Plate VI, figure 9), habitat Mexico and Central America; *Thasus gigas* Burm. (Plate VI, figure 10), frequenting the southwestern part of the United States and Mexico; *Sphictyrtus longirostris* Dist. (Plate VI, figure 11), occurring in Central America.

Photograph by Charles Martin

AN IFUGAO LOCUST CATCHER WITH HIS NET, IN LUZON

Locusts sometimes swarm in unbelievable numbers. In 1889 a vast army of them spread out over an area of more than 2,000 square miles, while flying over the Red Sea. Cyprus reported an invasion in 1881 during which 1,300 tons of eggs alone were destroyed.

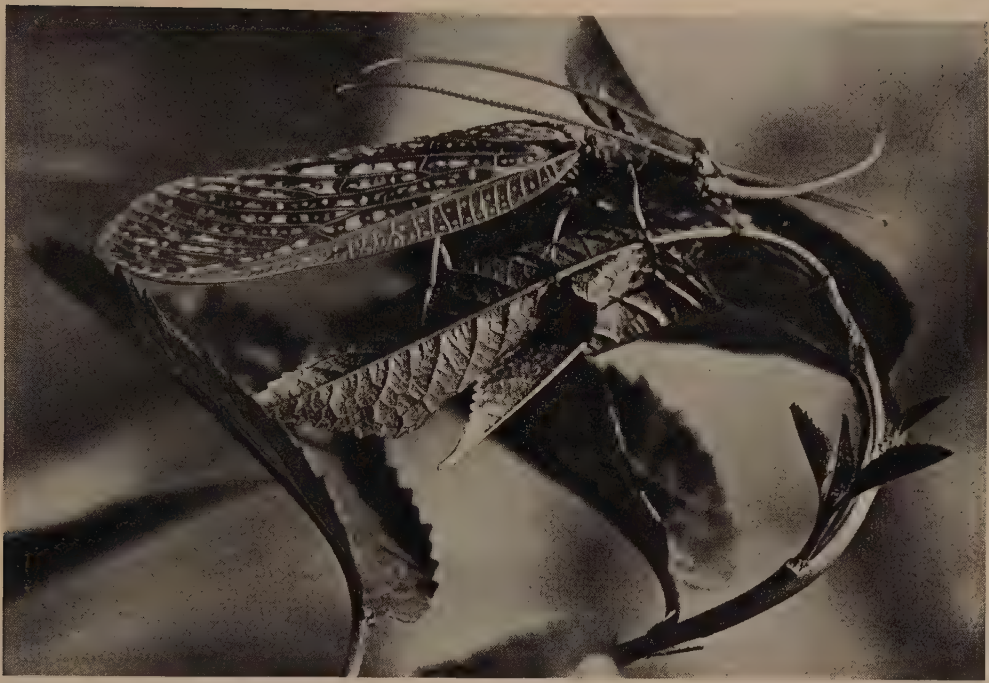
Assassin-bug Family (*Reduviidae*). This family, embracing some 2,000 species, most of them predaceous, feeds principally on the juices of other insects, draining the prey dry. To it belongs the famous kissing bug of yesteryear, whose young have coats of bristly, sticky hairs to which dust adheres, making a sort of mask from which its other name, masked bed-bug hunter, is derived. It is able to bite hard, inflicting a rather painful wound. Rarely, however, does it bite human beings unless attacked. Usually living out-of-doors, it sometimes invades vermin-haunted houses. In the South lives another member of the family known as the big bed-bug, which is a persistent sucker of human blood, and therefore is frequently rated as a kissing bug. The wheel-bug has a toothed



Photograph by James Dorsett

THE ARISTOLOCHIA FLOWER OF CEYLON DETAINS A FLY FOR ITS PURPOSES

The relationships between insects and flowers show many amazing adaptations. The Venus flytrap and the sundew are familiar flowers that capture flies. The aristolochia catches the fly (see on the inner rim at the right) and holds it a prisoner until the pollen carried on the insect's feet has fertilized the stigmas.



Photograph by Leonard Sefing

A HELLGRAMMITE FLY FINDS SAFETY IN MIMICRY

Before man ever dreamed of a World War, insects had come to be masters of the art of camouflage. Some of them employ fearsome aspects, others have acquired a low visibility, and still others imitate creatures that possess qualities distasteful to their natural enemies. The hellgrammite merges itself into its environment so that only sharp eyes detect its presence.

crest resembling a cock's comb on its thorax, and its eggs are shaped like little jugs, laid in masses of about 70.

The species reproduced are: *Microtomus purcis* Drury. (Plate VI, figure 2), inhabiting the southeastern United States; *Triatoma infestans* Klug. (Plate VI, figure 7), occurring in South America.

Cicada Family (*Cicadidae*). About 74 species of this family are found in our fauna, including the harvest-flies and lyremen. The most famous cicada, however, is the Seventeen-year Locust. Of all known insects it has the longest period of adolescence, spending 17 years under the ground in its larval stage and only a few weeks awing in its adult form.

Emerging from the ground after throwing off its larval clothes, it makes merry for a few days and then dies. In laying her eggs the female pierces the twigs of various trees, and in the slit thus made deposits them. These twigs later break and fall to the ground, and in about six weeks the young hatch and creep down beneath the surface to begin their long subterranean career. They feed on the humus in the soil and, to some extent, on the juices of the roots of trees and other deep-soil plants, and molt from four to six times during their underground life.

The species reproduced are: Malayan Cicada (*Huechys phoenicura* Germ. Plate VII, figure 1), occurring in the Malay Archipelago; Seventeen-year Locust (*Tibicina septendecim* Linn. Plate VII, figures 4 and 6), inhabiting the eastern United States; Brazilian Cicada (*Carineta formosa* Germ. Plate VII, figure 9), habitat Brazil; Mexican Cicada (*Zammara calochroma* Walk. Plate VII, figure 11), habitat Mexico and South America; Javanese Cicada (*Platypleura fulvigera* Walk. Plate VII, figure 12), habitat Malay Archipelago; Indian Cicada (*Gaeana sulphurea* Hope. Plate VII, figure 13), occurring in India.

Lantern-fly Family (*Fulgoridae*). While most of our lantern-flies are small, many of the tropical species are large and bizarre. Someone has said that their growth has gone to their heads. A Brazilian species looks something like an insectean hippopotamus, there being even the simulation of tusks on its dangerous-looking, but wholly innocent, head. Certain species of lantern-flies in China excrete large quantities of white, flocculent wax, which is used by the Chinese for candles and other purposes.

The species reproduced are: Indian Lantern-fly (*Saiva cardinalis* Butl. Plate VII, figure 2), living in India; Asiatic Lantern-fly (*Lycorma delicatula* White. Plate VII, figure 3),

Photograph by Will F. Taylor

A BEETLE OF THE BELGIAN CONGO ROLLING A BALL OF DUNG TO ITS NEST

This is a cousin of the famous sacred beetle of the ancient Egyptians, which was placed in the tombs with the dead, whose picture was painted on sarcophagi, and whose image was carved in stones and precious gems. The familiar rose beetle belongs to the same clan.

occurring in India and China; Mexican Lantern-fly (*Enchophora stillifer* Stal. Plate VII, figure 5), from Mexico and Central America; Philippine Lantern-fly (*Aphana astraea* Stal. Plate VII, figure 7), a native of the Philippines; *Fulgora maculata* Olivier. (Plate VIII, figure 4), inhabiting Ceylon and India; Chinese Candle Fly (*Fulgora candelaria* Fab. Plate VIII, figure 5), occurring in India and China; Panama Lantern-fly (*Phrictus tripunctata* Dist. Plate VIII, figure 6), habitat Panama; Duck Billed Lantern-fly (*Fulgora samarana* Baker. Plate VIII, figure 8), occurring in the Philippines.

Frog-hopper Family (*Cercopidae*). In rural strolls occasionally one sees small masses of froth adhering to the stems of taller grasses and weeds. This is a viscid fluid whipped into a heavy froth by an insect which gets its popular name, frog-hopper, from the belief that these masses are the spittle of tree frogs (see illustration, page 22).

One familiar species, the foamy cicadella, uses the froth it creates as a sunshade. With its proboscis sunk deep into a plant stem or leaf, it sucks out the sap, which it passes through a tiny mechanism at the tip of its abdomen. In this process it mixes air and a foam-forming substance with the sap, producing tiny bubbles having a tenacity that causes them to last for many hours.

The species reproduced are: Philippine Frog-hopper (*Gynopygoplax theora* White. Plate VII, figure 8), inhabiting the Philippines; Brazilian Frog-hopper (*Tomaspis furcata* Germ. Plate VII, figure 10), occurring in Brazil.

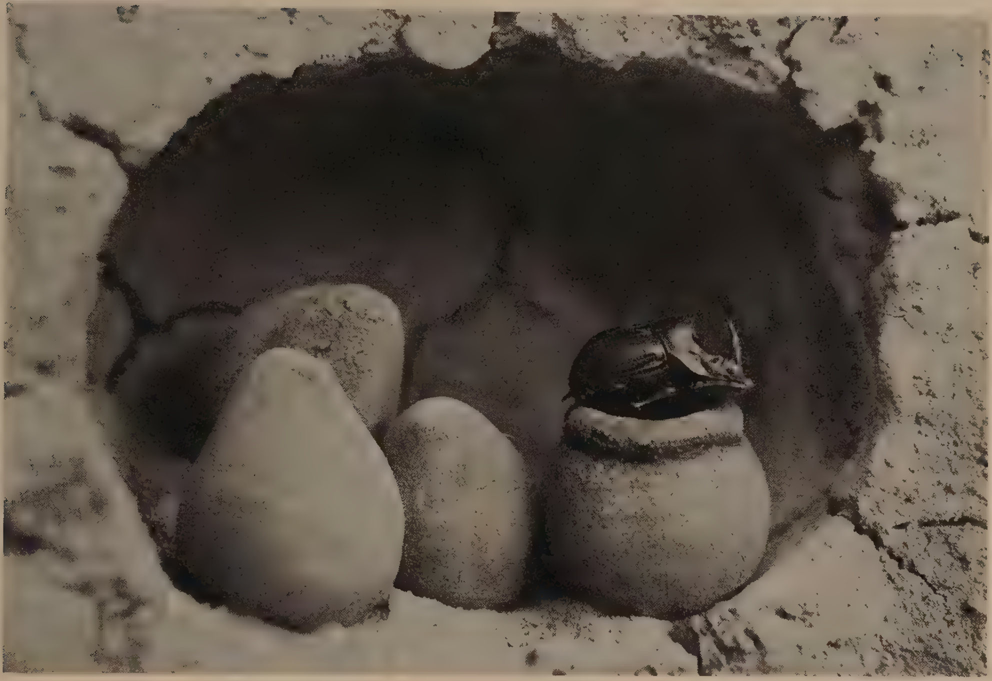
DRAGON- AND DAMSEL-FLIES

(Order *Odonata*)

Plate VIII

The creatures of this order might be called the hawks of insectdom. There are about 2,000 known species, 300 of which are found in the United States. Though bucolic superstition has it that the dragon-flies are snake doctors, that they sew up the ears of boys who wade in creeks, and that they are horse stingers and mule killers, they are, as a matter of fact, honest-to-goodness friends of everybody, since their favorite food is the pestiferous mosquito and the bothersome fly.

Compound eyes with as many as 30,000 facets are possessed by many species. These produce marvelous mosaics of images and give the possessor a wide angle of vision. Many species also have simple eyes to reënforce the powers of their compound optics. The dragon-fly's head is mounted on its body with an insectean version of a ball and socket joint, which enables the insect to see beneath and above itself—a power denied all except a few of the



Photograph by Paul Henri Fabre

A SCARAB OF SPAIN

It is one of the anomalies of Nature that, with few exceptions, the two groups of insects which show maternal solicitude for their young are the bees and the dung beetles. So intense is the affection of the latter for their children that the mother remains for four consecutive months without food, down in her burrow, looking after her brood, attending to their needs as grub, nymph, and finally as insect.

other members of the segmented, six-legged order of creatures.

In order to hold its prey, once overtaken, the dragon-fly groups its six legs together to form a basket in which the victim is clutched and held until the two front legs can get a firm grip on it. In some species the victim is eaten on the wing, in others the captor alights and eats at leisure. Most species breathe 118 times a minute as compared with the average man's 18 times. Ten pairs of breathing tubes lead from as many spiracles into the body.

The young of the damsel- and dragon-flies are wholly unlike their parents; they are aquatic. Down on the bed of a murky stream or muddy pond they dwell, thick of body, big of head, and half concealed in slime. Through their dirty, gray-green bodies they possess low visibility as they lie in ambush, waiting for some hapless creature to come their way.

When a May-fly larva, or a caddis-worm, or a water bug passes by on its unsuspecting way, the biggest mouth one ever saw on so small a creature opens wide and the luckless forager finds itself being chewed to pieces. The large lower lip effectually conceals the big mouth and sharp jaws until the prey comes by. Then the lip is extended and there shoots from the head a vicious pincerlike organ that grasps the victim and draws it in.

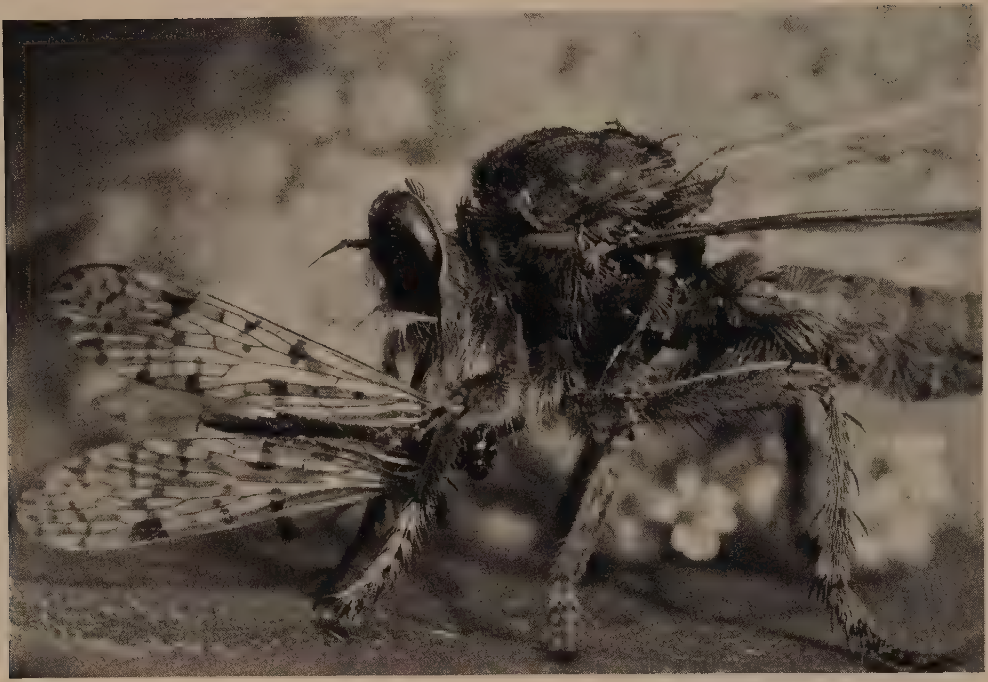
The nymphs propel themselves by drawing in and expelling drafts of water through their intestinal tracts. This expulsion is with considerable force, which, on the principle of the recoil of a gun, drives them forward a short distance.

Skimmer Family (*Libellulidae*). The dragon-flies of this family are found all over the country. The Water-prince is an unusually fine flyer and a hard creature to capture. The female flies alone when depositing her eggs, and makes her dips to the surface of the water some distance apart, so that her eggs may not be, so to speak, "all in one basket."

The species reproduced are: Ten Spot Skimmer (*Libellula pulchella* Drury. Plate VIII, figure 9), occurring in North America; Water-prince (*Epicordulia princeps* Hagen. Plate VIII, figure 11), also occurring in North America.

True Damsel-fly Family (*Agrionidae*). This family includes about 75 species in our fauna. The females deposit their eggs in the tissue of aquatic plants by cutting slits in the stems with their sharp ovipositors, or in the rubbish and mud along the border of ditches and the fringes of streams.

The males of some species are famous for the duels they fight. Flying about one another,



Photograph by Paul Griswold Howes

A ROBBER FLY WITH ITS PREY, A SCORPION-FLY

It is estimated that about 50 per cent of all the species of insects are engaged in preying on other species of their own kind. The robber flies are all swift, hairy, ferocious-looking creatures, without exception predatory. Some of them are very large, as much as two inches long. These latter do not hesitate to attack dragon-flies and bumble-bees and even the fierce and active tiger-beetles.

evidently in a consuming rage, each tries to get into a position to tear the other's wings, and the duel usually ends only when one of the contestants has been vanquished.

The Ruby-spot has been called by Kellogg a perfect masterpiece of insect beauty and grace. Only the males possess the colorful gems in their wings that give the species its name. Sometimes hundreds of them cling to willow branches in graceful festoons, where they look like strings of rubies.

The species reproduced are: Philippine Damsel-fly (*Pseudophaea refulgens* Selys. Plate VIII, figure 1), occurring in the Philippine Islands; Black-wing Damsel-fly (*Agrion maculatum* Beauv. Plate VIII, figure 2), inhabiting the eastern part of the United States; *Vestalis melania* Selys. (Plate VIII, figure 3), inhabiting the Philippines; Ruby-spot (*Hetaerina americana* Fab. Plate VIII, figure 7), habitat North America; *Neurobasis chinensis* Linn. (Plate VIII, figure 10), occurring in the Philippines.

BEES, WASPS, ANTS, AND THEIR KIN

(Order *Hymenoptera*)

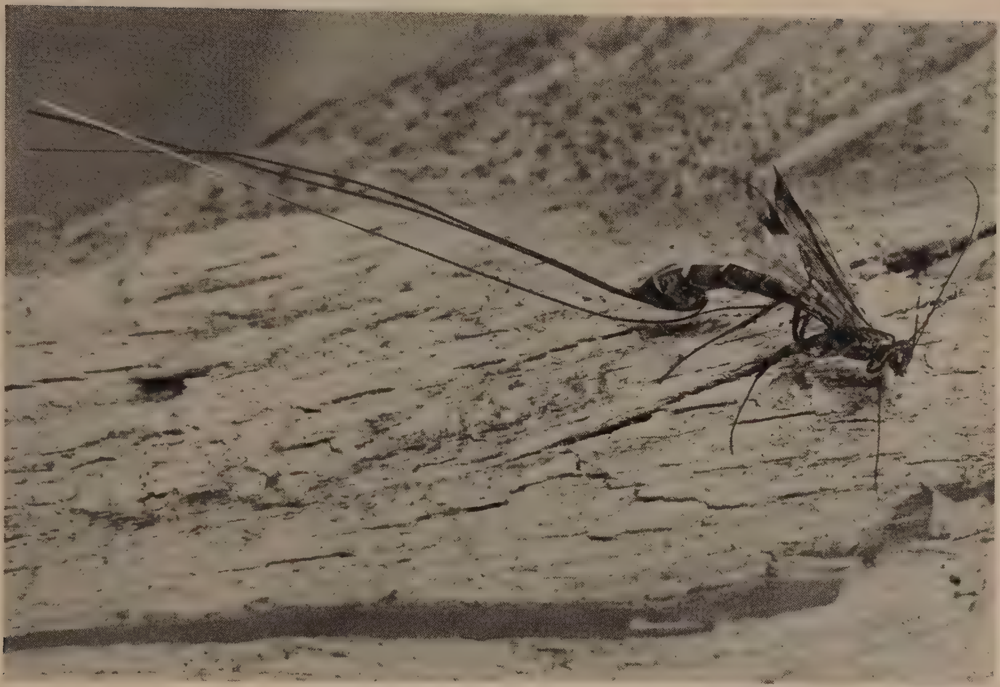
Plates X, XI, XII, XIII

More than 30,000 known species are grouped in this order, and there are perhaps ten times as many that never have been described, embracing not only the bees, wasps, and ants, but also the saw-flies, horn-tails, ensign flies, chalcid flies, gall flies, ichneumon flies, cuckoo flies, and many other lesser suborders, superfamilies, and families.

Thread-waisted Wasp Family (*Sphecidae*). Many species of solitary and hunting wasps, ranging in size and character of prey from the giant Cicada-killer to the little crabros whose quarry consists of harmless flies, are included in this family. They bag their game with rare finesse and preserve it with consummate art.

The familiar mud-daubers that build their several tubular cells side by side beneath porch roofs, on ceilings, and under the eaves of houses are characteristic members of the family. Although they work in mud, the mud-daubers are exquisite in their habits. If we watch one of them gathering a pellet of mud we will see her feet get dirty and the ends of her mandibles soiled; but, figuratively, she has her skirts carefully tucked up and her sleeves as carefully rolled out of harm's way. And when her work is over every particle of dirt must be scraped off both mandibles and feet.

When the dog days are with us, and lyremen, harvest-flies, and dog day cicadas begin their



Photograph by Lynwood M. Chace

AN INSECTEAN DRILL—(THALESSA) MEGARHYSSA LUNATOR

This ichneumon fly preys on the larvæ of the pigeon tremex, one of the horn-tails. The lowest of the three threadlike appendages is a flexible ovipositor. When the female finds the gallery of a pigeon tremex larva she elevates the ovipositor in a loop over her back and brings the tip down to the surface of the wood. She then makes a derrick out of her body and proceeds with great skill and precision to drill a hole into the burrow of the tremex. There she deposits an egg, from which soon emerges a larva to attack the larva of the tremex (see, also, text, page 52).

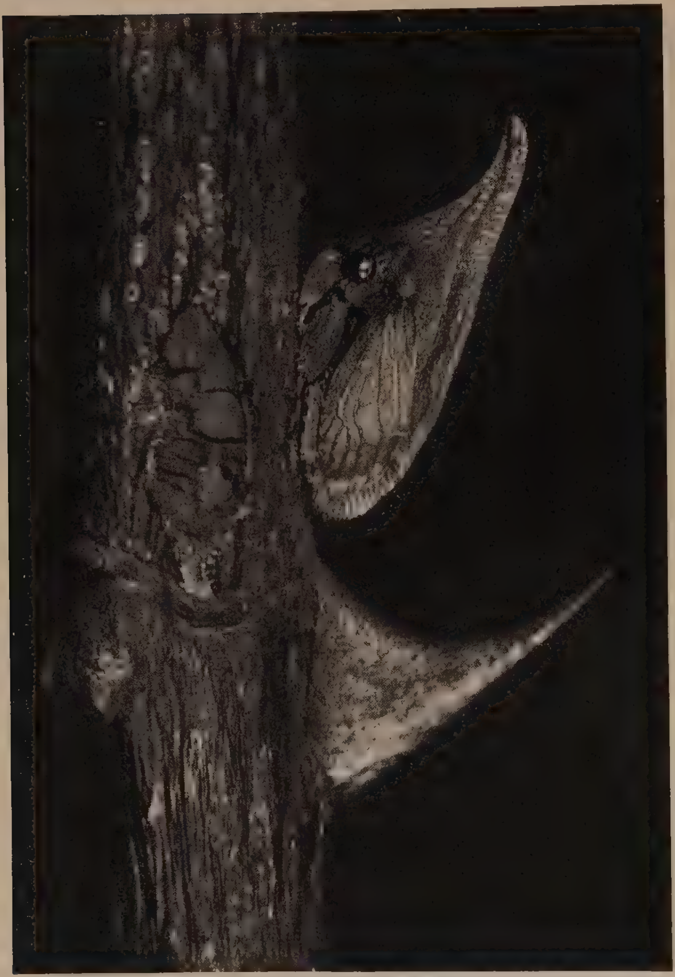
yearly din, their big, yellow-banded, rusty-black wasp enemy makes her appearance upon the scene, having come up out of the big burrow in clayey soil where her mother cradled her. Watch carefully and you will see the big huntress flying around in the vicinity of the source of the cicada's song. Suddenly that song ceases, and in its stead there comes a shrill, distressing, discordant note. The big wasp has driven her venomed dagger into the songster's nerve center, and with a shriek of pain the latter tumbles, along with its conqueror, to the ground.

Then comes the huntress's task of carrying her prey to her burrow. It is heavier than she is, so she gets astride it and laboriously drags it up a tree. From that vantage point she volplanes toward her burrow, after the fashion of a flying squirrel, and repeats the process until her home is reached.

Once there, she lays an egg under the middle leg of the victim, seals the cicada in a cell, and starts looking for another quarry. The egg hatches in two or three days, and the grub is assured of juicy meat, for the cicada has been paralyzed and not killed, and keeps fresh as long as the wasp's baby needs fresh meat. The grub attains full growth inside of ten days, and then spends two days spinning a cocoon of mixed silk and earth. In that it spends the winter, emerging from its transformation sleep in time to lend ear to the lyreman's call of a new season.

Another interesting species of this family is the sand wasp, known as the Ammophila. Dr. S. W. Williston, in studying them, discovered that these wasps actually have learned to use tools, but the discovery was so astounding to him that he feared to publish his observations at first, lest all mankind should pronounce him a "Nature faker." But many another entomologist has confirmed his discovery. After a mother Ammophila has finished digging her gallery, she captures a lot of small caterpillars or other insects, according to her species, paralyzes them, stocks the cell with them, and, after laying an egg in proximity to the provender, seals up the nest; then she fills the burrow with dirt. She often has been observed using a small pebble as a "tamping iron" to pack the soil in solidly, so as to remove effectually all trace of the gallery.

The Cerceris wasps, of which there are numerous American species, also belong to this family. They are exploiters of beetles and weevils. Some species specialize on the adults



Photograph by L. G. Saunders

A "BROWNIE" THAT MIMICS A THORN

One needs only to glance at the thorn itself and the tree-hopper above it to see how difficult it would be for an enemy of this insect to distinguish it from the thorn, whose protection it seeks through imitation (see, also, illustration, page 43).

of the flat-headed wood-borers. But though these vary widely alike in size, color, and aspect, the wasps that hunt them are able to recognize all of them with as much accuracy as the entomologist. Defour found 400 beetles that represented all the hues of the tar pot and the lapidary's show case combined, and were of all shapes and sizes, in Cerceris wasp cells. The wasps that gathered them never once went out of the wood-borer clan for their prey. Those Cerceris wasps that hunt weevils are just as good classificationists as the hunters of flat-headed wood-borers. Little weevils, big weevils, highly colored weevils, and those that are garbed in drab hues are all recognized by their wasp exploiters.

Anatomists who are masters of their art are the members of this family. Whether they be species that hunt wood-borers or species that prey upon weevils, each captive has its nerves centered in one ganglion. One thrust from the wasp's poisoned dagger produces complete paralysis, but not death, for death would mean mortification in a few days, and the babies of Cerceris must have fresh meat.

For weeks the beetle lives on, under the most powerful of sense-extinguishers. The wasp's egg, laid at the tenderest spot of the beetle's abdomen, hatches out, and the little grub begins to eat its way into the interior of the victim's carcass. But though the beetle's meat is as fresh as the day it was stung, there is no movement and no sense of pain.

Such a skilled surgeon was the mother of the grub that with her lance and her drug she was able to arrest sense and motion, and yet leave life. It is as if a man were to thrust a dagger into a steer's neck, insert with a hypodermic syringe a bit of poison into the wound, and establish a paralysis that would enable his child to carve the victim piecemeal over a period of four or five weeks, the beef meanwhile retaining its original freshness.

Another of the thread-waisted wasp family is Philanthus, a hunter of bees, not for her own rations but for her babies. For in her adult life she is a honey drinker and nectar sipper, while her babies are meat eaters. To present them with bees whose honey sacs were filled would be like giving a child a bouquet with a viper hidden in the flowers. Yet Mrs. Philanthus scarcely would be able to single out bees with empty crops. She therefore is under the necessity of emptying the bees' honey sacs before presenting them to her grubs. To do this she cannot deal with paralyzed bees.

Only death itself will produce that muscular relaxation necessary to force the last drop out of the bee's crop. Therefore, we find in her a new kind of surgeon. She has discovered that by forcing down the head of the bee, a tiny opening in its armor is found—an opening less than one twenty-fifth of an inch in diameter. With unerring aim Mrs. Philanthus causes her sting to penetrate the vital spot. A little poison is injected into the wound, and almost instantly antennæ and mandibles become still. Death supervenes in a minute or so, and then the wasp begins a kneading process that forces out the last drop of honey from the bee's crop. This she drinks with gusto, and then carries the honey-drained victim to her home and gives it to her baby.

The species reproduced are: Sphex Wasp (*Chlorion cyaneum* Dahlb. Plate X, figure 1), inhabiting North America; Siamese Wasp (*Chlorion lobatum* Fab. Plate X, figure 3), native of Siam; Cicada-killer Wasp (*Sphecius speciosus* Drury. Plate X, figure 10), inhabiting the United States; Solitary Wasp (*Stictia signata* Linn. Plate XI, figure 2), occurring in Central America; American Mud-dauber (*Sceliphron caementarium* Drury. Plate XI, figure 7), living in North America; American Hunting Wasp (*Ammobia ichneumonea* Linn. Plate XI, figure 9), occurring in North and Central America.

Photograph by Paul Henri Fabre

STAG-BEETLES READY TO DO BATTLE OVER A FEMALE OF THE SPECIES

The adult beetles are found on trees, where presumably they live, for the most part, on the sap flowing from bruised places, and on honeydew of aphids and scale insects. Their eggs are laid in crevices of the bark near the base of the trunk. The fat-bodied grubs burrow into the tree, where they stay, in some species, for as long as six years.

Velvet Ant Family (*Mutillidae*). These handsome insects are not ants at all, but rather wingless wasps, which so closely resemble ants as frequently to be confused with them. Only the females are wingless, the males being possessors of the art of flight. Most of the members of this family are guests or parasites in the nests of other wasps and bees. They are strong stingers and swift runners, and number about 200 species in the United States.

The species reproduced is: Velvet Ant (*Dasymutilla occidentalis* Linn. Plate X, figures 2 and 6), found in North America.

Spider Wasp Family (*Psammocharidae*). Most species of this family are digger wasps, although a few are masons. The giant tarantula killer, the largest of all our wasps, belongs to this clan, and its sensational combats with the great hairy tarantula often are seen in the Southwest. Occasionally both lose, the tarantula paralyzed by the wasp's sting and the wasp dying from the poisonous wounds made by the great fangs of the spider. Those wasps of the family which burrow in the ground first find their victims and sting them until they are paralyzed. Then they dig a burrow, which is enlarged at the lower end, forming a cell for the reception of the spider; and the quarry then is dragged down into the cell and an egg attached to it, after which the passage to the cell is filled with earth.

The species reproduced is: Spider Wasp (*Pepsis cinnabarina* Lucas. Plate X, figure 4), which occurs in the southern part of North America and Central America.

Carpenter-bee Family (*Xylocopidae*). The carpenter-bees build their nests in wood. Perhaps the most familiar member of this family

Photograph by Lynwood M. Chace

A CRICKET'S GOLDEN CASTLE—A PUMPKIN BLOSSOM

"April comes to an end, and the cricket's song begins, at first in rare and shy solos, soon developing into a general symphony, in which every clod of turf boasts its performer." (See, also, text, page 37).

is the big, black carpenter-bee, as large as a bumble-bee, which excavates a burrow one-half inch in diameter in dry lumber. This burrow runs across the grain for about half an inch, and then makes a right-angle turn and runs with the grain for from 12 to 20 inches.

The bee works from two to three days on the small section of the tunnel that runs across the grain, and from three to five weeks on the remainder. If man did as much in proportion to his size, he could dig a tunnel two feet in diameter from end to end of a log 90 feet long, with no tool but his teeth.

The species reproduced are: Sumatran Carpenter-bee (*Xylocopa caerulea* Fab. Plate X, figure 5), inhabiting Sumatra; American Carpenter-bee (*Xylocopa virginica* Linn. Plate XI, figure 1), occurring in North America; Carpenter-bee (*Xylocopa bombylans* Fab. Plate XII, figure 8), living in Australia.

Euglossid Bee Family (*Euglossidae*). The several species of this family of bees are solitary in habits. Many of them have not been studied carefully, but those which are known build their nests from bits of boxwood which they fasten together with the resin or gum of trees.

The species reproduced are: Tropical Bee (*Eulaema dimidiata* Linn. Plate X, figure 7), a native of Central America; South American Bee (*Exaerte frontalis* Guer. Plate X, figure 8), found in Central and South America; *Euglossa variabilis* Friese. Plate XII, figure 10), found in Central America.

Social Wasp Family (*Vespidae*). This family includes the hornets, the yellow-jackets, and the wasps that build paper nests. Unlike the social bees and ants, the members of the social wasp family found in temperate regions

Photograph by Lynwood M. Chace

A CRICKET CONFERENCE ON AN EAR OF CORN

While the crickets we know best are the black and brown varieties found in houses and fields, there are many others we see less frequently. Some of these live in trees like katydids, others burrow into the ground like moles, and still others dwell as guests in ants' nests. Most of them hear with their legs and sing with their wings (see text, page 14).

are unable to set up a permanent communal life.

There is a vast lot of work to be done in the making of a hornet's nest as big as a half bushel. In the spring it is smaller than a hen's egg; it has been built by some queen that has survived the winter. The house must be made roomier as the family grows, not by building additions here and there, but rather by a gradual and symmetrical expansion of the entire structure. Think how often each bit of weatherboarding must be moved to keep the size of the house always expanding uniformly with the increase in the size of the family!

But the hornets are equal to the task, though that task is as if we took a six-room house and expanded it into a Windsor Castle without interfering in the slightest with the family routine on the inside, or with the shapeliness of the structure on the outside.

The hornets have the requisite engineering skill to carry the undertaking through to a successful conclusion. They gather from the weathered surfaces of boards, rails, and posts the pulp out of which they build the walls of the nest. Bit by bit they take the material from the inside of the nest walls and plaster it on the outside, supplementing it with new material gathered abroad. In this way the inside of the house always is being put on the outside, and the growth of the nest provided for.

Many species of yellow-jackets build their nests in hollow logs and stumps. What most laymen know as the common wasp belongs to the genus *Polistes* of the *Vespidae* family. It builds but a single comb, always in a place protected from the elements, so that there is no need for the outer covering provided by the hornets. Like their cousins, the yellow-jackets and the hornets, they bring food to their babies as it is needed rather than store it up in the cell before the egg is deposited. There are some exceptions to the general rule that the *Vespidae* are social wasps. A few unfamiliar species are solitary in their habits.

The species reproduced are: Asian Wasp (*Vespa mandarina* Smith. Plate X, figure 9), found in Asia; European Social Wasp (*Vespa crabro* Linn. Plate XI, figure 10), a native of Europe and Asia and introduced into North America; Yellow-jacket (*Vespula carolina* Linn. Plate XII, figure 6), found in North America.

Bumble-bee Family (*Bombidae*). The bumble-bee family is represented by numerous species in our fauna, most of whose communities are short-lived rather than permanent. The only individuals that live over winter are the fertilized females. They find some cranny or crevice where the frost cannot reach them, and there fall into a winter-long sleep.

When spring arrives they seek a deserted mouse hole, mole burrow, or other cavity in the ground. To these nests they bring pollen and honey which they knead into bread. Then they lay eggs in simple cells, and the larvæ that hatch from them grow fat and strong on the bread prepared in advance by the mothers. When the grubs are grown they spin silken cocoons in which they pupate, and out of which they emerge full-fledged bumble-bees. Then they immediately set to work looking after the welfare of their newly hatched younger sisters and brothers, serving as nursemaids, housemaids, food gatherers and what not, and freeing their elder sisters for field work.

When winter approaches the colony dies, leaving behind only a few fertilized females, whose duty it will be to start the work again the next year. There are some species of bumble-bees that are parasitic on their more industrious cousins. They closely resemble the working clans and possess no worker caste.

The species reproduced is: Common Bumble-bee (*Bombus americanorum* Fab. Plate XI, figure 3), found in North America.

Ichneumon Fly Family (*Ichneumonidae*). The ichneumon fly family possesses some 6,000 known species. Most of them are parasitic and exploit the caterpillar tribe, thus helping to keep in check some of the worst enemies of the American garden, orchard, truck patch, and field. The adults, as a rule, lay their eggs on the caterpillars, and the larvæ hatch out and burrow into the wretched host, literally eating it alive. Anyone who gathers cocoons to see what kinds of insects issue therefrom will have ichneumon flies coming from them almost as frequently as the rightful owners.

An interesting ichneumon is known as (*Pimpla*) *Ichneumon conquisitor*. It preys on the tent-caterpillar. When the latter's cocoon is spun, the ichneumon, with its ovipositor, makes an opening in the silken case and deposits its egg. The parasite has at once a choice cradle and a meal for its needs—at the expense of the sleeping, transforming caterpillar.

Another species, (*Pimpla*) *Ichneumon inquisitor*, preys not only on tent-caterpillars but also on army-worms, tussock moths, caterpillars, and the like.

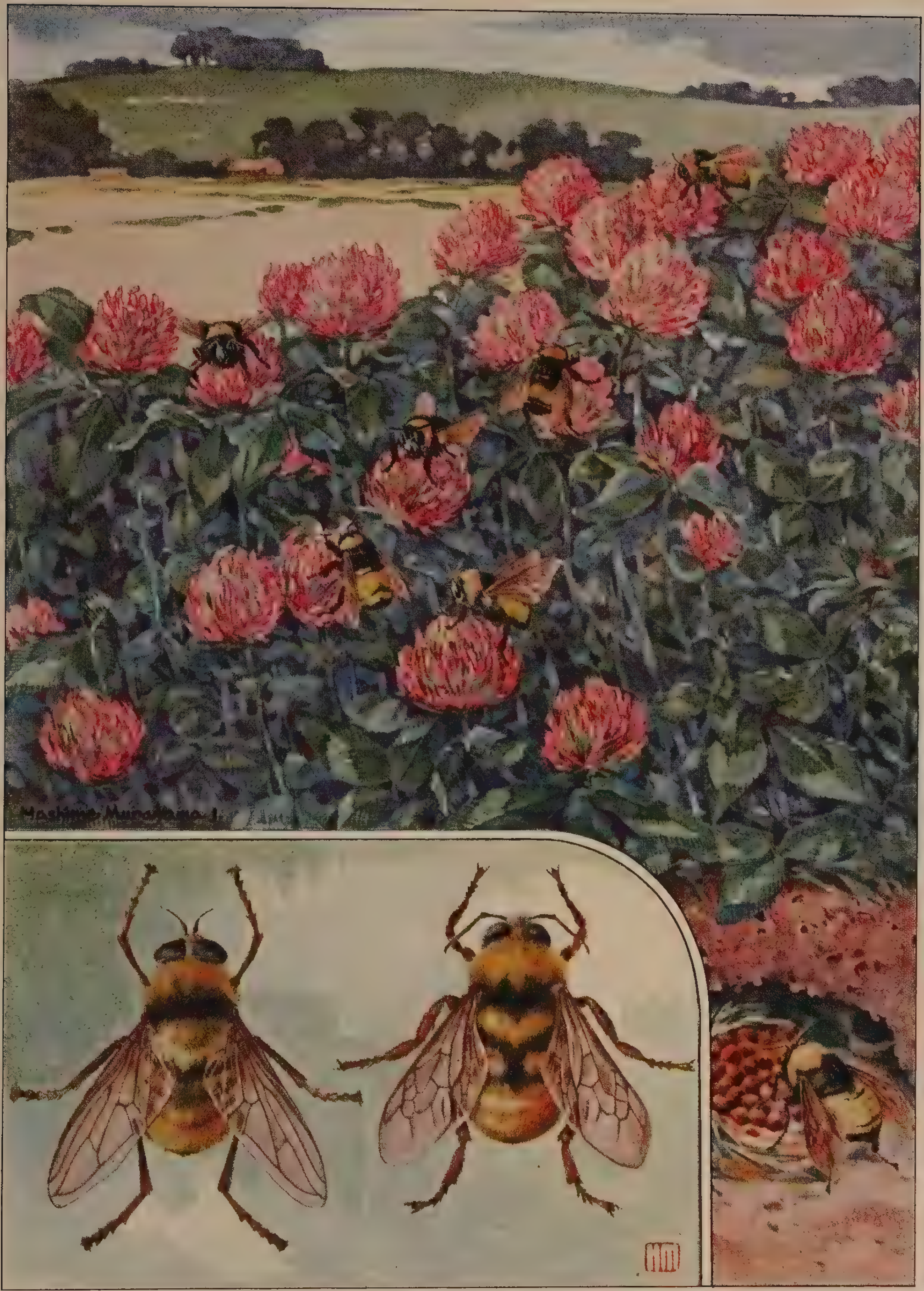
The most interesting of all the ichneumon flies is probably (*Thalessa*) *Megarhyssa lunator*. The female of this species has an amazing ovipositor, often as long as six inches, which is made up of several hairs and a flexible tube. The hairs form a sheath for the latter, which is the boring-tool proper. Thin and flexible as it seems to be, Mrs. Thalessa, once she has located, deep in the hard wood of a tree, the boring grub of a pigeon tremex, bends her long abdomen down, throws her ovipositor up over her back and brings the end of it down to the wood. She then begins as fine a drilling operation as one would wish to see, often driving the hole down three or four inches into the wood (see illustration, page 47). After the female completes the boring, she converts her drill into an egg-tube, and through it pumps an egg down into the burrow of the pigeon tremex's baby (see, also, Horn-tail Family, page 61).

This egg promptly hatches, and soon attaches itself to the luckless tremex grub which it gradually devours, and then lies down for a transformation nap.

Sometimes when Mrs. Thalessa starts to drill, the wood is so tough that it grips her drill and she remains a prisoner until starvation ends her career.

The species reproduced are: American Ichneumon Fly (*Amblyteles grandis* Brulle. Plate XI, figure 4), American Ichneumon Fly (*Trogus elegans* Cress. Plate XI, figure 5), American Ichneumon Fly (*Trogus rileyi* Cress. Plate XI, figure 6), *Agathilla bradleyi* Vireck (Plate XIII, figure 1), *Amblyteles jucundus* Brulle. (Plate XIII, figure 4), *Platylabus clarus* Cress. (Plate XIII, figure 5), *Amblyteles jucundus* Brulle. (Plate XIII, figure 6), *Polyaenus spinarius* Brulle. (Plate XIII, figure 8), *Amblyteles w-album* Cress. (Plate XIII, figure 9), *Ichneumon irritator* Fab. (Plate XIII, figure 10), *Amblyteles semicaeruleus* Cress. (Plate XIII, figure 11), *Labena grallator* Say. (Plate XIII, figure 12), all found in North America; *Macrojoppa blandita* Cress. (Plate XIII, figure 2), habitat Central America; *Cyanoxorides caeruleus* Cameron. (Plate XIII, figure 3), found in the Philippine Islands; *Callicryptus fasciipennis* Brulle. (Plate XIII, figure 7), a species found in Cuba; *Lissopimpla semipunctata* Kirby. (Plate XIII, figure 13), native of Australia.

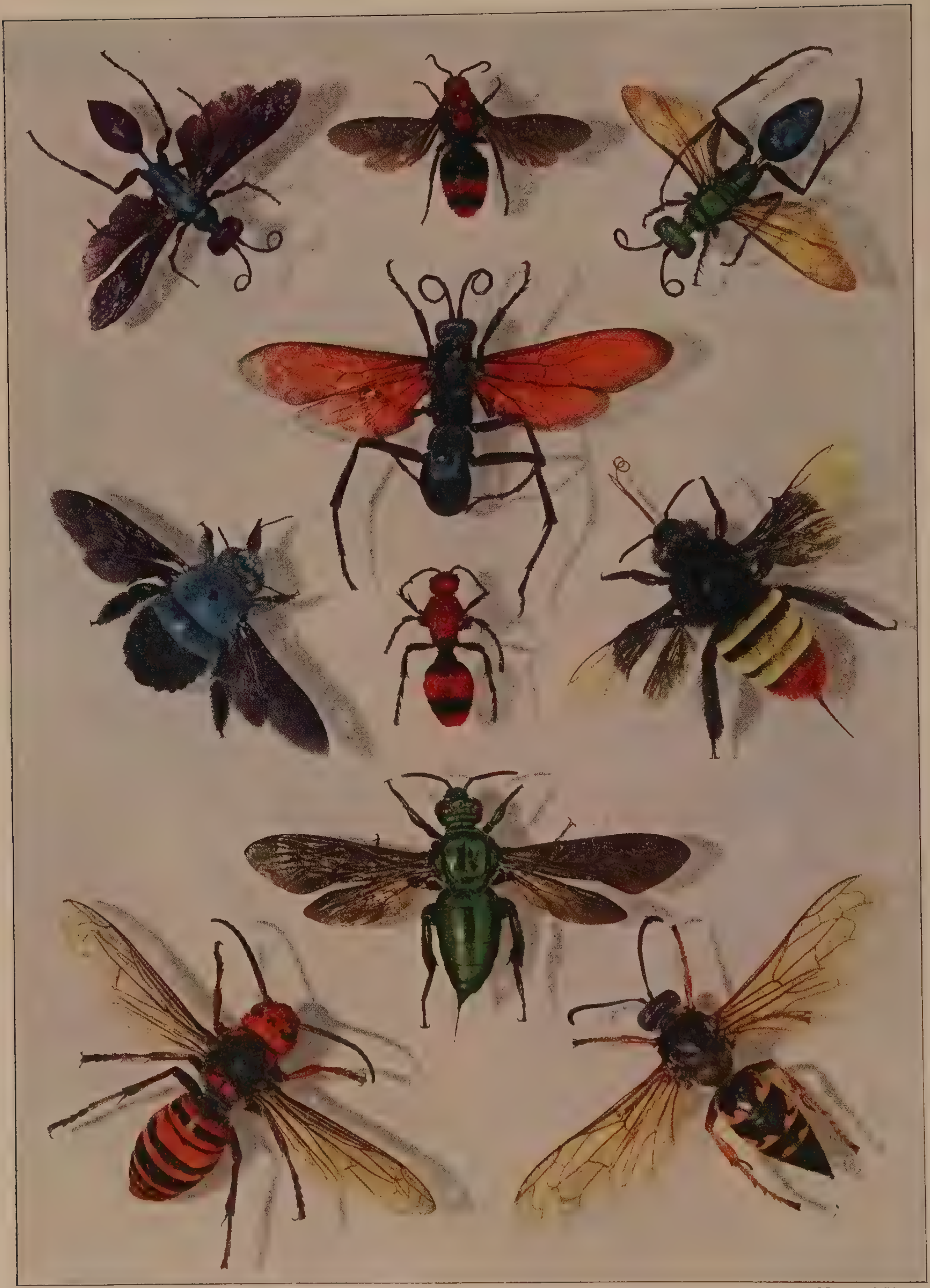
Scoliid Wasp Family (*Scoliidae*). The species of this family neither builds nests nor transports prey to them. Rather it digs into the ground, where the grubs of the family to which the May beetle belongs are to be found. Discovering one of these, the wasp stings and



© National Geographic Society Painting by Hashime Murayama

THE BUMBLE-BEES GATHERING NECTAR IN THE CLOVER FIELD

The artist here has succeeded in giving a typical picture story of the life of the Bumble-bee Family. In the inset the figure on the right is the familiar bumble-bee of the East, and that at the left a fly that has copied it in appearance so thoroughly that the bumble-bees receive it as a welcome guest in their nests. The species portrayed in the main picture is *Bombus americanorum;* the one in the inset is *Bombus huntii*. The fly belongs to the species *Criorhina kincaidi*. The fly and bumble-bee in the inset are 1½ times natural size.



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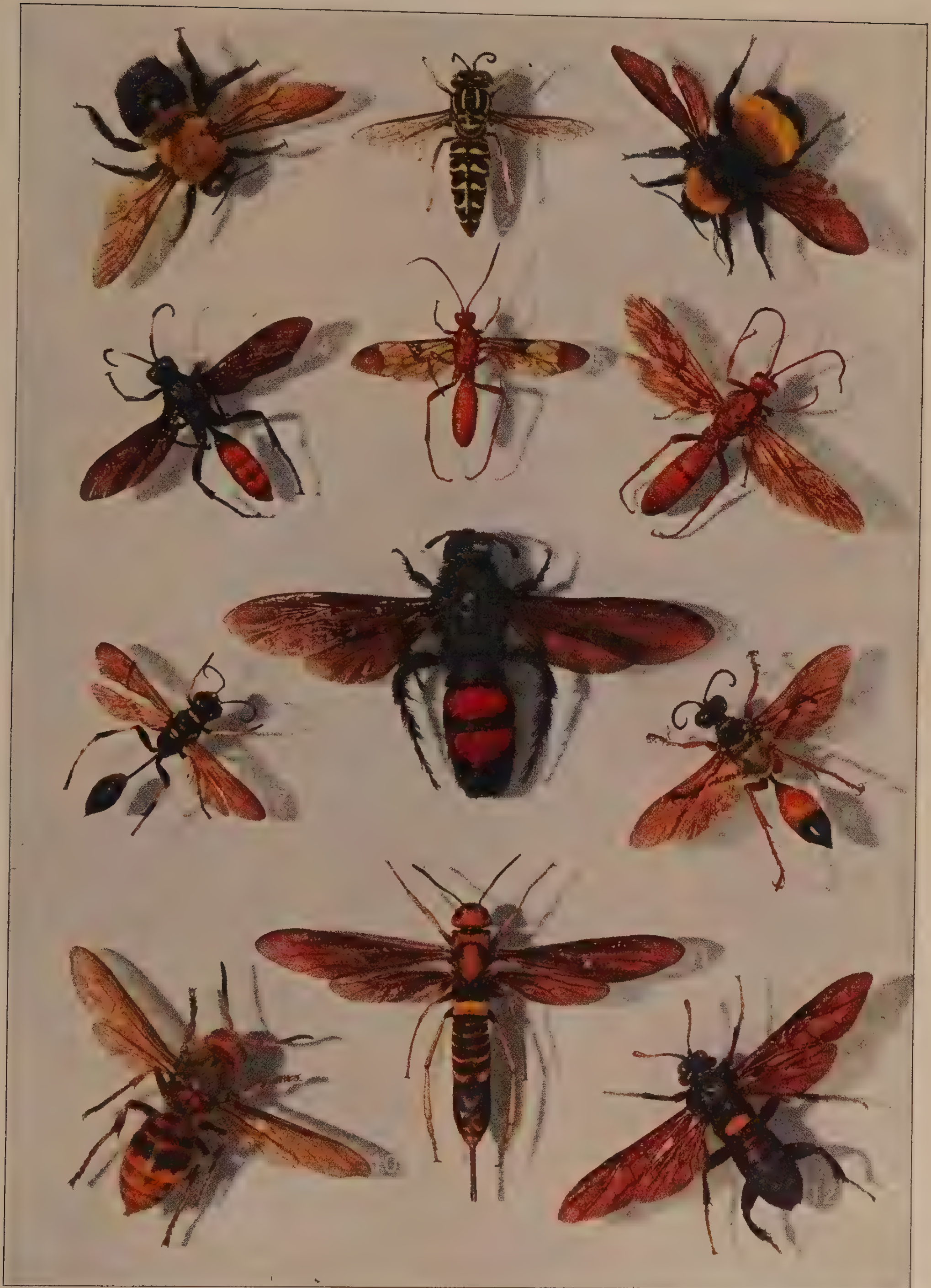
Natural Size

SOME OF THE FAIREST AMONG THE WASPS, BEES, AND VELVET ANTS

(1) Sphex Wasp, *Chlorion cyaneum* Dahlb. [Female]; (2) Velvet Ant, *Dasymutilla occidentalis* Linn. [Male]; (3) Siamese Wasp, *Chlorion lobatum* Fab. [Female]; (4) Spider Wasp, *Pepsis cinnabarina* Lucas [Female]; (5) Sumatran Carpenter-bee, *Xylocopa caerulea* Fab. [Female]; (6) Velvet Ant, *Dasymutilla occidentalis* Linn. [Female]; (7) Tropical Bee, *Eulaema dimidiata* Linn. [Female]; (8) South American Bee, *Exaerte frontalis* Guer. [Female]; (9) Asian Wasp, *Vespa mandarina* Smith [Female, queen]; (10) Cicada-killer Wasp, *Sphecius speciosus* Drury [Female]. See text under the following Family headings: Thread-waisted Wasp, Velvet Ant, Spider Wasp, Carpenter-bee, Euglossid Bee, and Social Wasp. The habits of the several species of these insects show to what a high degree of versatility members of a single Order may attain, whether in social relationships, home-building habits or food-gathering and storing methods.



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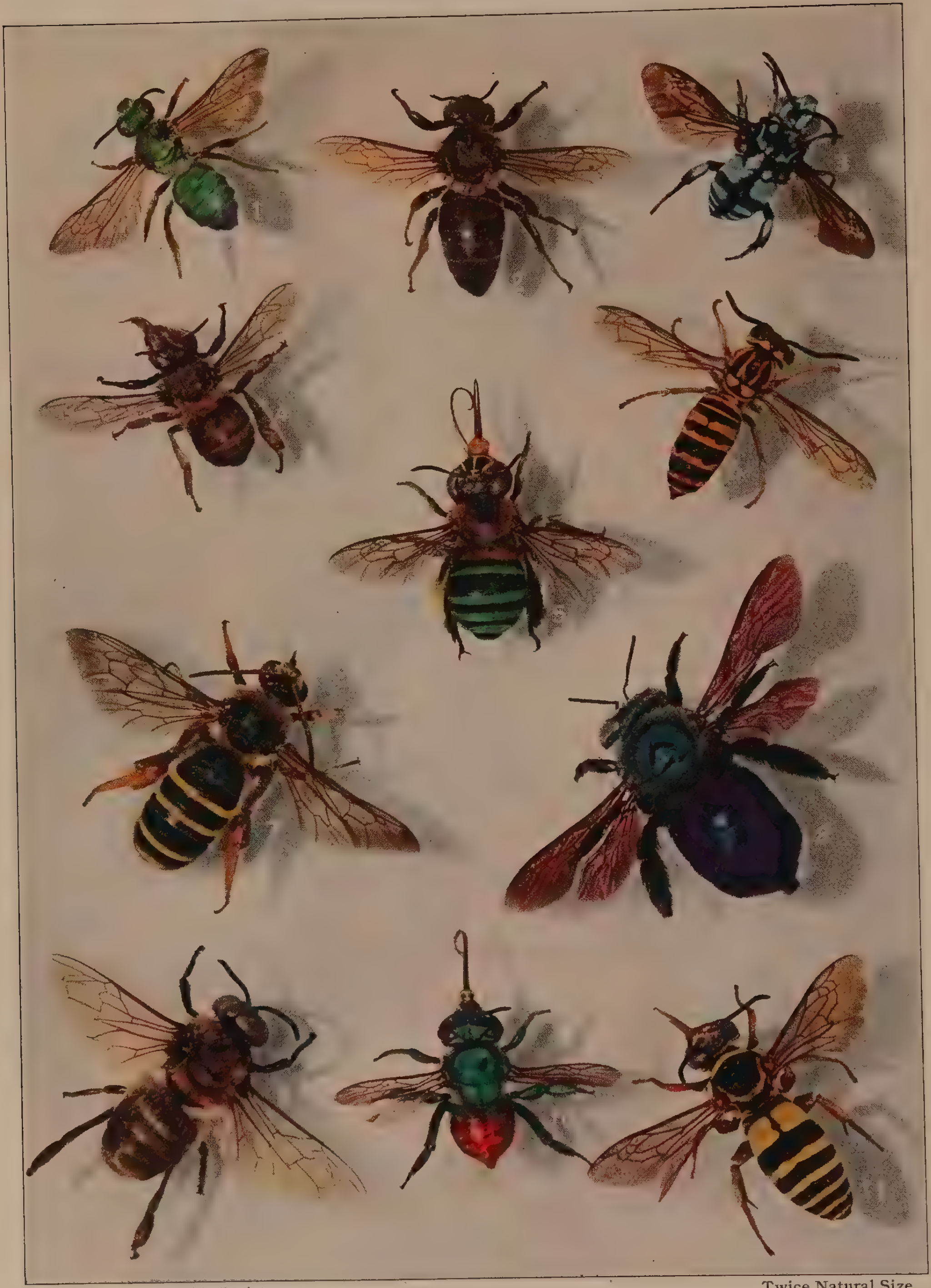
1⅙ times Natural Size

FROM CARPENTER-BEES TO SAW-FLIES RANGES THE COLLECTION ON THIS PLATE

(1) American Carpenter-bee, *Xylocopa virginica* Linn. [Male]; (2) Solitary Wasp, *Stictia signata* Linn. [Female]; (3) Common Bumble-bee, *Bombus americanorum* Fab. [Female, queen]; (4) American Ichneumon Fly, *Amblyteles grandis* Brulle [Female]; (5) American Ichneumon Fly, *Trogus elegans* Cress. [Female]; (6) American Ichneumon Fly, *Trogus rileyi* Cress. [Female]; (7) American Mud-dauber, *Sceliphron caementarium* Drury [Female]; (8) South American Burrowing Wasp, *Campsomeris ephippium* Say [Female]; (9) American Hunting Wasp, *Ammobia ichneumonea* Linn. [Female]; (10) European Social Wasp, *Vespa crabro* Linn. [Female]; (11) Common Horn-tail, *Tremex columba* Linn. [Female]; (12) American Saw-fly, *Cimbex americana* Leach [Male]. See text under the following Family headings: Carpenter-bee, Thread-waisted Wasp, Bumble-bee, Ichneumon Fly, Scoliid Wasp, Horn-tail, and Cimbicid.



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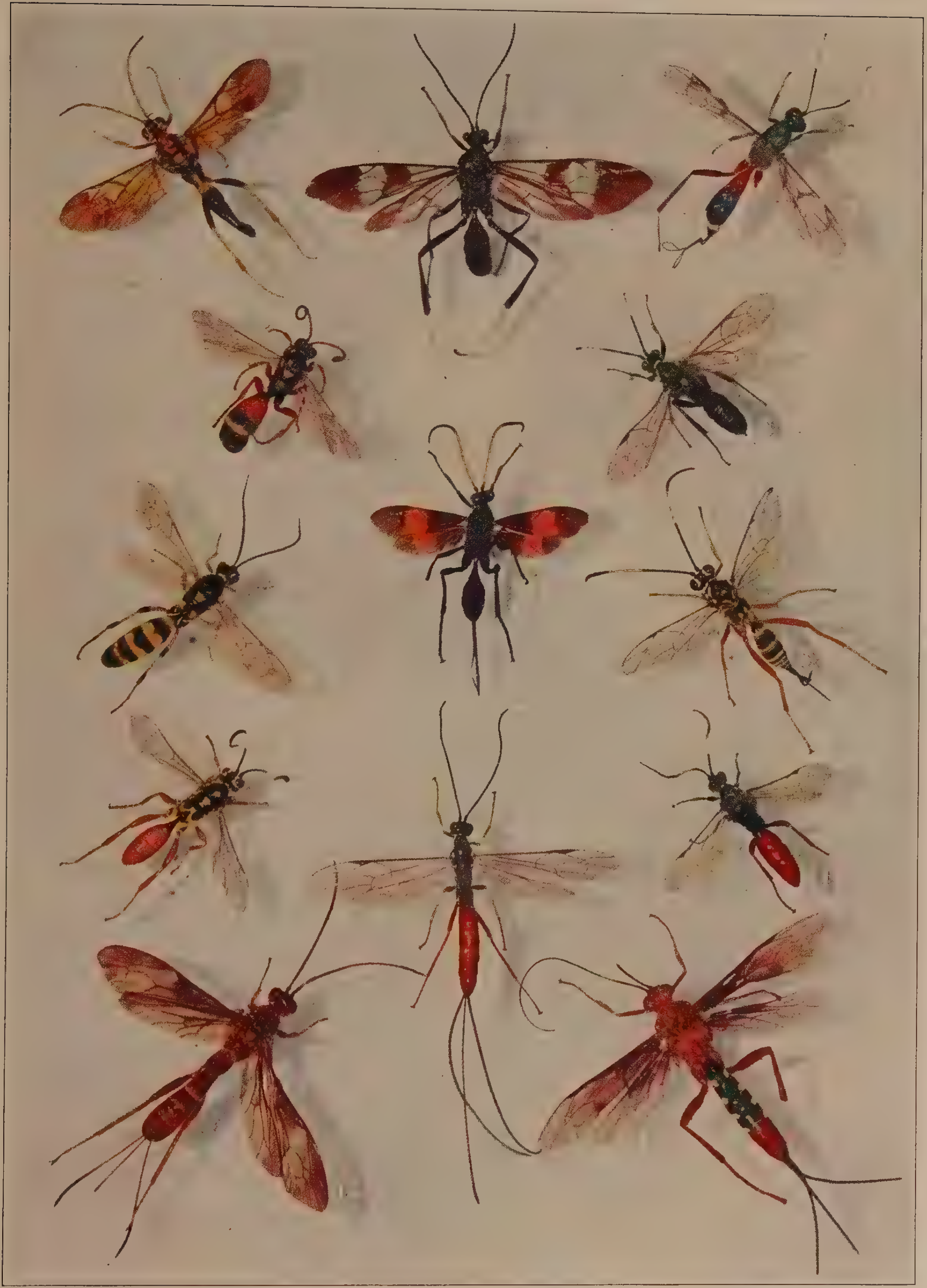
Twice Natural Size

A GROUP OF HYMENOPTERS OF STRANGELY CONTRASTING WAYS OF LIFE

(1) American Burrowing Bee, *Agapostemon splendens* Lep. [Female]; (2) Honey-bee, *Apis mellifera* Linn. [Female, queen]; (3) *Crocisa crucifera* Ckll. [Female]; (4) Honey-bee, *Apis mellifera* Linn. [Female, worker]; (5) *Anthophora zonata* Linn. [Female]; (6) Yellow-jacket, *Vespula carolina* Linn. [Female, worker]; (7) *Nomia nortoni* Cress. [Male]; (8) Carpenter-bee, *Xylocopa bombylans* Fab. [Female]; (9) Honey-bee, *Apis mellifera* Linn. [Male, drone]; (10) *Euglossa variabilis* Friese [Female]; (11) *Triepeolus quadrifasciatus* Say [Male]. See text under the following Family headings: Halictus Bee, Honey-bee, Melecta Bee, Anthophora Bee, Social Wasp, Carpenter-bee, and Euglossid Bee.



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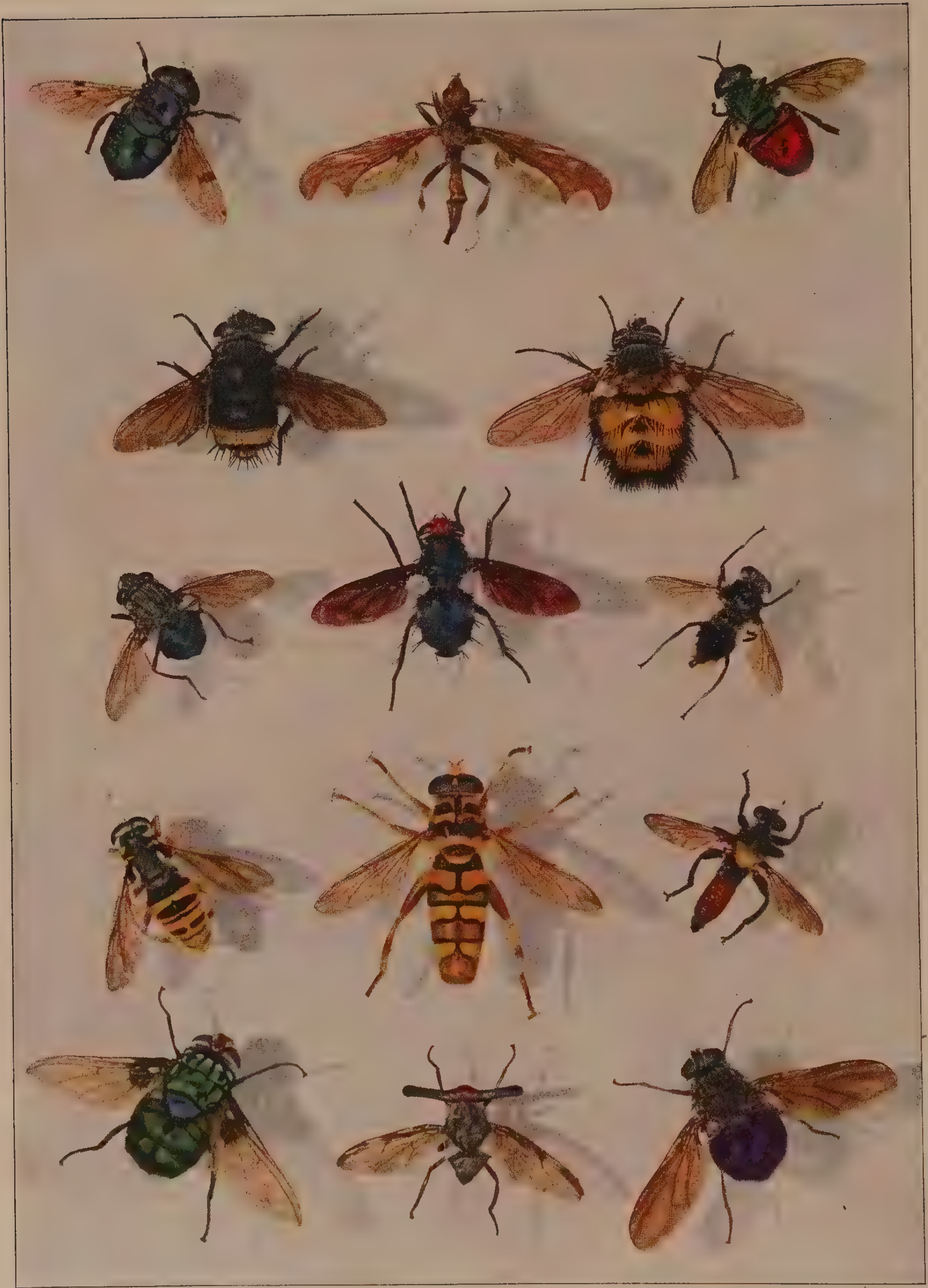
1½ times Natural Size

A BAKER'S DOZEN OF ICHNEUMON FLIES THAT ARE MAN'S CONSTANT ALLIES

(1) *Agathilla bradleyi* Vireck [Male]; (2) *Macrojoppa blandita* Cress. [Male]; (3) *Cyanoxorides caeruleus* Cameron [Female]; (4) *Amblyteles jucundus* Brulle [Female]; (5) *Platylabus clarus* Cress. [Female]; (6) *Amblyteles jucundus* Brulle [Male]; (7) *Callicryptus fasciipennis* Brulle [Female]; (8) *Polyaenus spinarius* Brulle [Female]; (9) *Amblyteles w-album* Cress. [Female]; (10) *Ichneumon irritator* Fab. [Female]; (11) *Amblyteles semicaeruleus* Cress. [Female]; (12) *Labena grallator* Say [Female]; (13) *Lissopimpla semipunctata* Kirby [Female]. All of the species represented on this Plate belong to the single Family of the Ichneumon Flies. Few among any of the Families of all the Orders of insects render man a greater service than the Ichneumon Flies.



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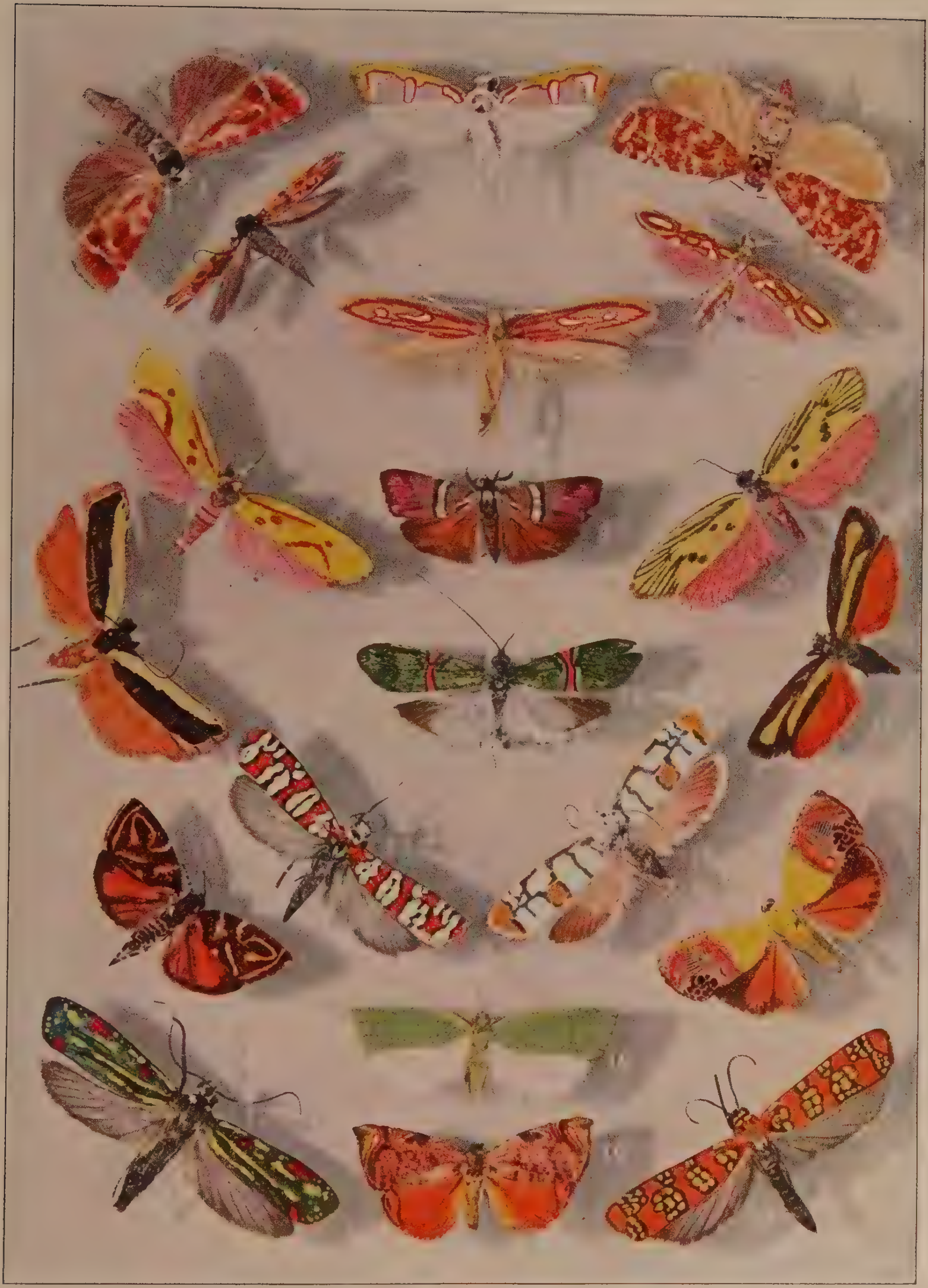
1½ times Natural Size

TWO-WINGED FLIES—FAMILIAR AND OTHERWISE

(1) Tropical Hover Fly, *Volucella obesa* Fab. [Female]; (2) May Beetle Fly, *Pyrgota undata* Wiedemann [Female]; (3) Florida Ant Fly, *Microdon fulgens* Wiedemann [Female]; (4) Eastern Tachina Fly, *Belvesia bifasciata* Fab. [Female]; (5) Western Tachina Fly, *Paradejeania rutiliodes* Jaennicke [Female]; (6) Central American Bot Fly, *Dermatobia hominis* Linn. [Female]; (7) Scavenger Fly, *Silbomyia fuscipennis* Fab. [Female]; (8) Ox Warble, *Hypoderma lineatum* DeVilliers [Female]; (9) Eastern Hover Fly, *Temnostoma excentricum* Harris [Male]; (10) *Milesia virginiensis* Drury [Male]; (11) California Robber Fly, *Laphria coquilletti* McAtee [Male]; (12) Australian Nimble Fly, *Rutilia splendida* Donovan [Female]; (13) *Achias amplividens* Walker [Female]; (14) Costa Rican Blow-fly, *Mesembrinella umbrosa* Aldrich [Female]. See text under the following Family headings: Hover Fly, Pyrgota Fly, Tachina Fly, Bot Fly, Blow-fly, Robber Fly, Nimble Fly, and Ortalid Fly.



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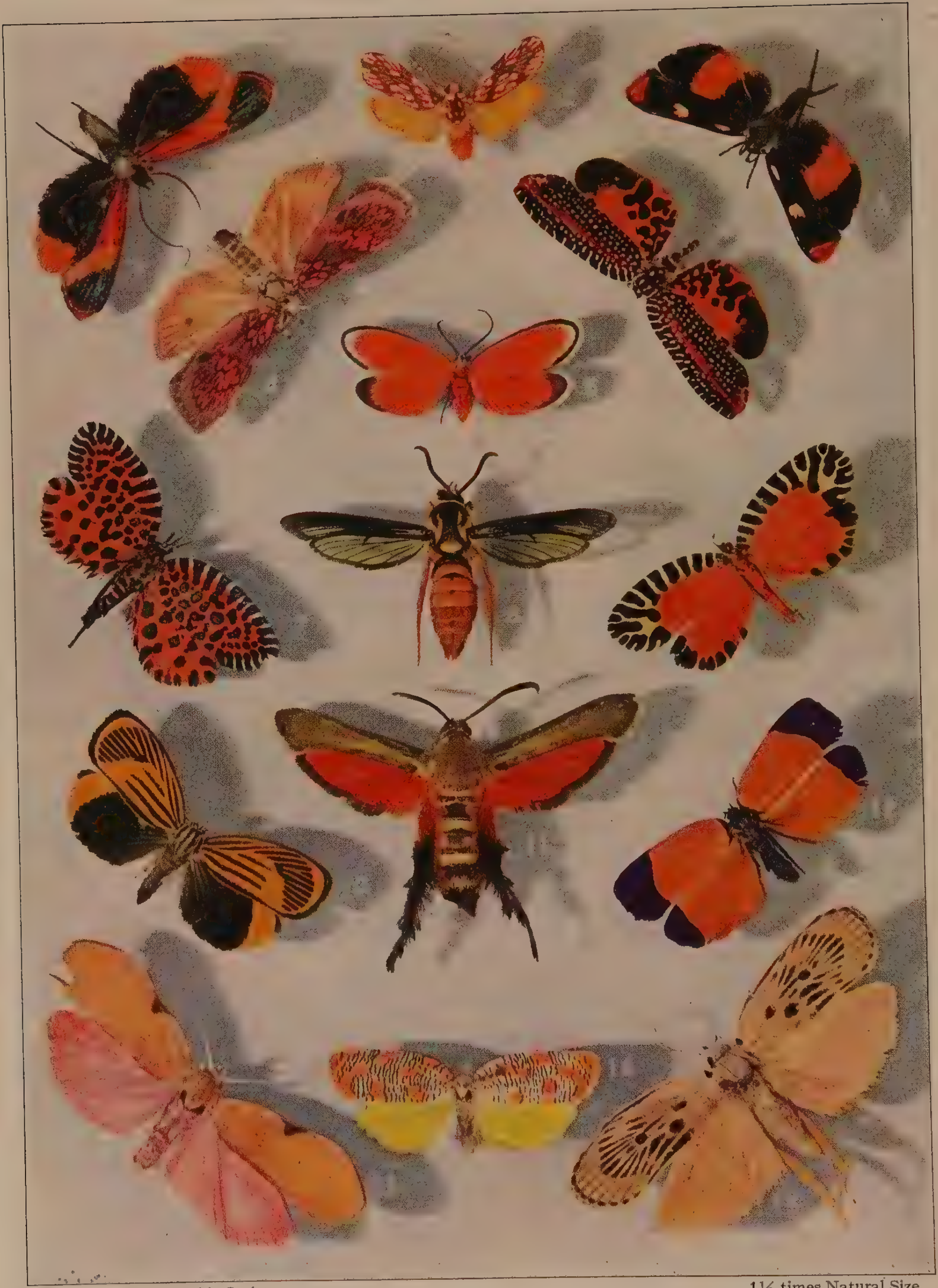
Twice Natural Size

LILIPUTS OF THE SCALY-WINGED WORLD—MICRO-LEPIDOPTERA

(1) European Pine Shoot Moth, *Rhyacionia buoliana* Schiffermüller [Female]; (2) *Lupercalia ignita* Busck [Male]; (3) Virginia Pine Moth, *Petrova virginiana* Busck [Female]; (4) *Psacaphora edithella* Barnes & Busck [Male]; (5) Palmetto Leaf-miner, *Homaledra heptathalama* Busck [Female]; (6) *Filinota hermosella* Busck [Male]; (7) *Atasthalistis tricolor* Felder [Female]; (8) *Mieza citrina* Busck [Male]; (9) *Tortyra cuprinella* Busck [Female]; (10) *Mieza laetae* Hubner [Female]; (11) *Mieza spatula* Busck [Male]; (12) *Hemerophila albertiana* Stoll [Male]; (13) *Atteva exquisita* Busck [Female]; (14) *Nematois chrysoprasias* Meyrick [Male]; (15) *Ethmia festiva* Busck [Female]; (16) *Grapholitha egregiana* Felder [Female]; (17) *Atteva hysginiella* Wallengreen [Female]; (18) *Phytomimia chlorophylla* Walsingham [Female]; (19) *Mictopsichia durranti* Walsingham [Male]; (20) *Atteva pustulella* Fab. [Male]. All of the Families represented on this Plate will be found in the text under the Order heading The Little Moths.



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1⅓ times Natural Size

A CHARMING GROUP OF MICRO-LEPIDOPTERA ARRAYED IN RESPLENDENT ROBES

(1) *Coryptilum klugii* Zeller [Male]; (2) *Lactura conflagrans* Walker [Male]; (3) *Atasthalistis concinnalis* Feisthamel [Male]; (4) *Hypercallia miniata* Dognin [Female]; (5) *Pseudotalara regia* Schaus [Female]; (6) *Cerace onustana* Walker [Male]; (7) *Pseudatteria leopardina* Butler [Female]; (8) *Paranthrene palmi* Harry Edwards [Female]; (9) *Pseudatteria mimica* Felder [Female]; (10) *Imma grammozona* Meyrick [Male]; (11) Western Clear Winged Moth, *Melittia gloriosa* Harry Edwards [Male]; (12) *Megalodoris electrina* Meyrick [Male]; (13) *Stenoma elegans* Zeller [Female]; (14) *Tortrix animosana* Busck [Female]; (15) *Stenoma armata* Zeller [Male]. The Micro-lepidoptera Families lack common names. The species represented on this Plate will be found in the text under the Order heading The Little Moths.

paralyzes it and then builds a crude cell around it, after attaching an egg to the grub. The larva of the wasp, hatching out, consumes the grub and then spins a cocoon in which it develops.

The species reproduced is: South American Burrowing Wasp (*Campsomeris ephippium* Say. Plate XI, figure 8), found in South and Central America.

Horn-tail Family (*Siricidae*). This family consists of about 100 species, about one-third found in America. Its members are mostly rather large, brightly marked, and well-built. The adult female has an ovipositor consisting of five pieces, the two outside ones forming a sheath, and two of the others being furnished at the tip with a series of fine, hard, transverse ridges arranged like the teeth of a file. With this she is able to match the work of a gimlet or auger in human hands, and can drill innumerable holes in the solid wood of a tree. In each of these she places an egg.

The best-known of the horn-tails is the pigeon tremex, which is about one and one-half inches long, with a rusty head and thorax, and a black abdomen with yellow bands and spots. The female bores a hole half an inch deep into elms, oaks, sycamores, and maple trees. The larvæ, hatching from the eggs laid therein, burrow into the heart wood where they grow into cylindrical, blunt-ended, whitish grubs, measuring about an inch and a half in length.

When ready to transform into an adult insect, the grub makes a cocoon of silk and chips, and then goes to sleep. On awakening as a full-fledged pigeon tremex it bores out at right angles to the gallery dug by the grub, instinctively knowing that in such direction lies the shortest way to liberty.

The European grain cephus, whose larvæ bore into the stems of wheat and cause the straw to break about harvest time, belongs to the horn-tail tribe. About the time the head of the wheat begins to form, the fly bores a small hole in the straw. When the larva hatches from the inserted egg, it tunnels down the stem, and by wheat-cutting time has passed below the level of the cutter bar. In this way it remains in the stubble, where it makes a silken cocoon and hibernates.

The species reproduced is: Common Horn-tail (*Tremex columba* Linn. Plate XI, figure 11), found all over North America.

Cimbicid Family (*Cimbicidae*). The most familiar species of the group is the American Saw-fly. Its eggs are laid in June in crescent-shaped slits made in leaves. The food plants are elm, birch, linden, and willow. When disturbed the larva spurts a fluid from glands just above the spiracles. When it is full-grown it burrows in the ground, makes an oval, brownish cocoon, and spends the winter there, not changing to a pupa until spring. It emerges in May or June.

The species reproduced is: American Saw-fly (*Cimbex americana* Leach. Plate XI, figure 12), habitat North America.

Halictus Bee Family (*Halictidae*). Some of these bees are larger than a fair-sized wasp and some are smaller than a house-fly. Every halictus carries what has been called a clearly written certificate of her guild. It is a smooth, shiny line, or groove, on the last segment of the abdomen that acts as a guide for the sting. Some species build wonderful cells for their babies.

The burrows in which these are located may be rough, but the cradles must be perfect. Leading from the burrow, the cells are excavated so as to resemble water bottles laid on the side. No human plasterer ever did a finer job than these bees. First there is a coating of clay, its surface roughened like the outside of a thimble. On this is laid a smooth coat, mixed with saliva and carefully troweled with the tongue—a glazing that is exquisite in its perfection, and both damp- and waterproof.

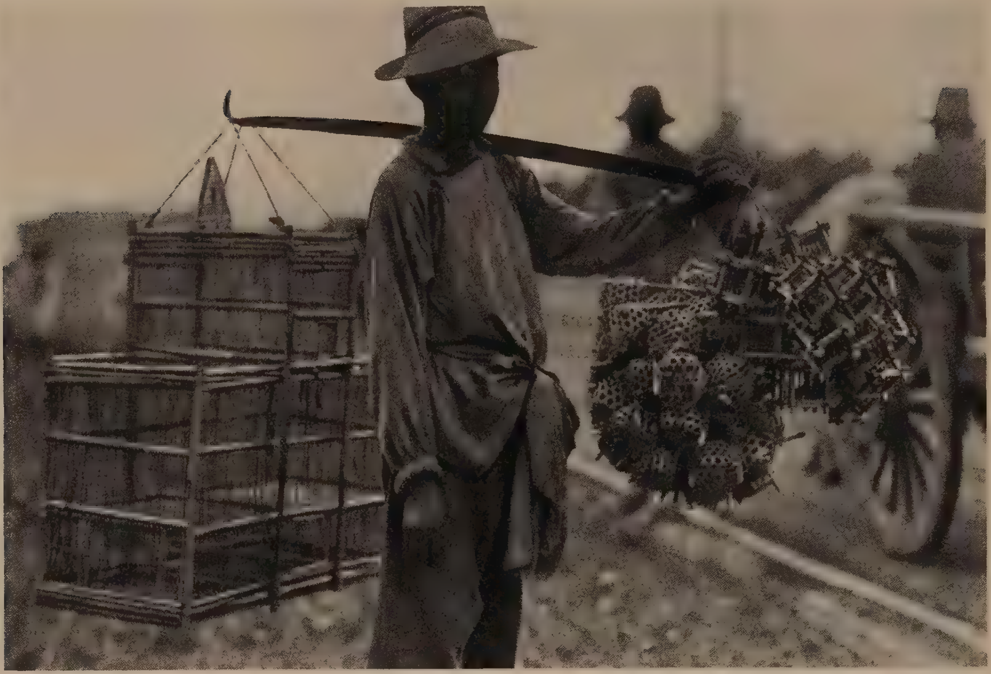
A small fly which the ordinary observer dismisses as nothing but a gnat, makes it her business to lay her eggs in the halictus's cells. Under the microscope she is revealed as a red-eyed, white-faced, gray-corseleted, black-legged marauder.

One species of this family studied by Fabre, the zebra halictus, possesses a quality rarely observed in the insect world—interest in grandchildren. The mother bee, of the spring generation, having passed the winter in some frost-proof retreat, gives the mansion she has built so laboriously to her daughters. Each daughter builds a small addition to the burrow and makes a group of cells of her own, but all use the main burrow in common.

The grandmother of the brood in the cells stands guard at the doorway, to keep out all but the rightful entrants—her daughters. Her velvet dress, so clean and handsome when she was a youthful matron, is now threadbare and dingy. Gone is the nap, all but lost are the beautiful stripes of red and brown.

But she has a grandmother's pride in the newly hatched grubs, and woe betide any creature who cannot show the yellow foot of the halictus folk when seeking to reach those grub chambers! A drubbing the marauder never will forget will be his certain portion. At the door, all day long, sits poor, bald-headed grandmother, a ghost of her former self, in a little sentry box at the mouth of the burrow, stepping aside to all those who can give the countersign, but wild as a witch in her anger toward any would-be intruder. Mayhap her remarkable guard over her grandchildren comes from the knowledge that some of them will be males. Denied the privilege of having sons, by that strange quirk of Nature which makes all the children of the spring generation females, she must look to her grandchildren for her male progeny. And each of those grandchildren is hatched into the world without a father.

With no males produced from the eggs of the spring mother, and no males having survived the winter, they perforce are born under that strange departure from the orthodox laws of reproduction known as parthenogenesis.



Photograph by Maynard Owen Williams

A CHINESE PEDDLER OF BIRD AND CRICKET CAGES

Singing crickets in cages are as familiar in the Orient as singing canaries in the Occident. Even the department stores in the larger cities of Japan cater to the cage-cricket trade. Hundreds of thousands of the insect Kreislers are sold every year.

The species reproduced are: American Burrowing Bee (*Agapostemon splendens* Lep. Plate XII, figure 1), common in North America; *Nomia nortoni* Cress. (Plate XII, figure 7), occurring in North America.

Honey-bee Family (*Apidae*). The best known species of this family is the common hive-bee, *Apis mellifera.* A winter colony of honey-bees may consist of 10,000 members, and a summer colony of 50,000. Nowhere else in the world of Nature is maternal egotism so marvelously developed as in the queen bee.

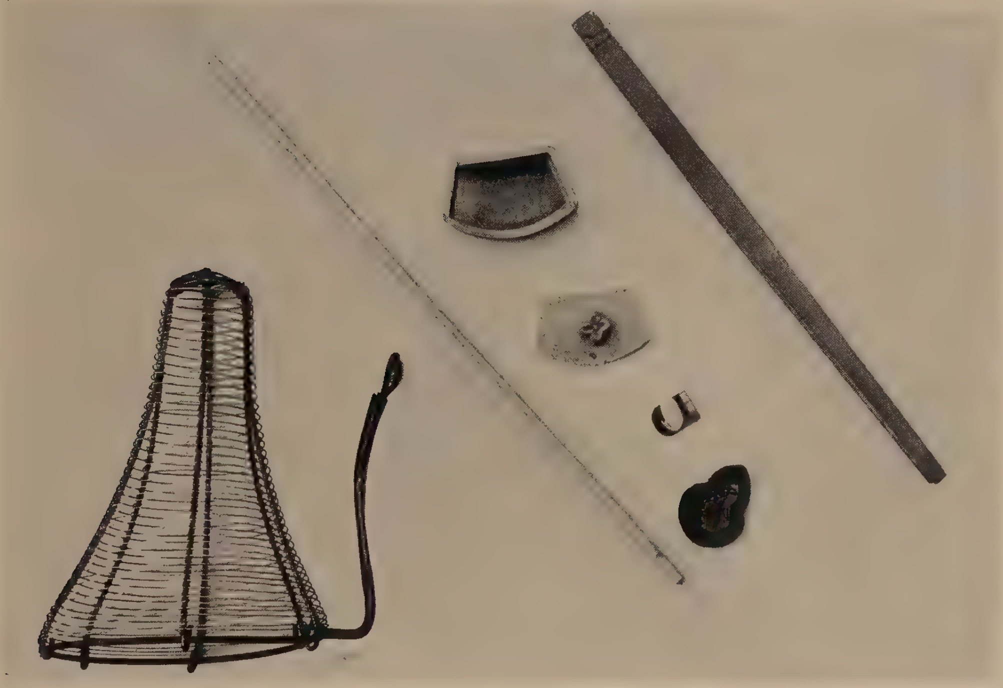
In each hive one queen, and only the queen, has the right to motherhood—a law of the bee world as unalterable as the laws of the Medes and Persians. If another queen appears, even though she be the ruling sovereign's own daughter, there is civil war, and one or the other must leave. Fifty thousand of her children must renounce maternity and vow themselves to celibacy, although they could, if they willed, lay parthenogenetic eggs from which female bees would hatch. Indeed, in queenless hives, a worker does for the moment take up the task of egg-laying until a real queen is hatched.

There are brood cells and food cells to be built, food to be stored, wax to be secreted, filth to be removed, younglings to be nursed, invaders to be repelled, currents of air to be kept circulating, and queens to be supported. If we were to visit a hive at swarming time, we would, if we listened well, hear a great commotion within. A daughter grub has been fed with royal jelly and has blossomed forth a queen. She is ready to dispute with the mother the scepter of that hive. A battle royal takes place. Mother and daughter each have their adherents. If one is not the victim of the other's sting, the worsted one—and usually it is the mother that is worsted—sets up a shrill piping. This is a call to her adherents to join in shaking the dust of that bee city from their feet, and to go where base ingratitude does not reign, but where peace may rule again.

The wax from which honeycomb is fabricated is a secretion that exudes through tiny pores in a series of small plates on the under side of the bee's abdomen. In order to secrete one ounce of this wax the bees must eat 20 ounces of honey. They fill themselves to the gullet, then hang in festoons from the ceiling.

By internal exertions they get warm enough to give the wax a liquid consistency as it oozes through the plates. Later it hardens, and then is removed, either by the manufacturer herself, or by another worker. After that it is kneaded and mixed with saliva with great care, and then put into the comb. In making brood comb, old wax may be used, but for honeycomb only new wax is employed. After the brood cells are made, the queen lays her eggs

SILVERTON HIGH SCHOOL



Photograph by James Dorsett

EQUIPMENT USED IN HANDLING FIGHTING CRICKETS IN CHINA

In some parts of the Celestial Republic the sport of cricket fighting is as common as cockfighting in the countries of the Caribbean. At the left is the wire cage used for transferring the fighters to and from the ring. The light ferule next to the cage is the tickler, to stir up the fighters to a proper degree of anger. Beyond that are, respectively, from the bottom, the drinking trough, the food rack, the top of the cricket's house, and the house itself. At the right is a set of bamboo tweezers for handling food and equipment (see illustration, page 65).

in them. In three days these hatch into tiny larvæ, which are footless, helpless, soft-bodied grubs.

The nurses at once attend them, giving them as their first food a sort of pap or jelly formed in the nurses' stomachs and regurgitated for the grubs. After a few days, this diet is strengthened by the addition of a little honey and pollen to the menu. After a few days more, a bee bread made of honey and pollen is put into the cell, which then is sealed. After eating this, the grub falls into its transformation sleep, and slumbers for 13 days.

Then it awakens a full-fledged bee. But before it can go out into the open it must spend ten days or two weeks as an indoor worker, mayhap as a nurse, a scavenger, a ventilator, or each in turn. When the worker goes out she has the choice of drinking a given portion of nectar or of carrying it back to the hive. In front of her stomach is a honey sac. She fills this with nectar, carries it to the hive, regurgitates it into a honey cell or else into the mouth of an indoor worker.

Gradually the excess of water is evaporated, on the same principle that cane juice is boiled down into molasses. To render the honey antiseptic and to make it "keep," a tiny bit of formic acid is added to it by the bee. The pollen for the bee bread on which the indoor worker and the maturing larvæ feed is gathered from the flowers, tucked away in the pollen baskets on the bee's hind legs, and carried home.

It so happens that often, in hot weather, the natural condensation of the moisture of the hive is checked. At such times many workers transform themselves into winged water wagons, bringing water in their honey sacs to the thirsty ones in the hive. At other times material is needed to stop up the cracks and chinks in the hive—to keep out cold air—and they gather the resinous saps of various plants for mortar.

The ventilation of a hive is a fascinatingly interesting process. Workers arrange themselves on the floor and through the superstructure of the hive, and by a synchronized vibration of their wings set up air currents that expel the impure air and draw in the fresh, employing exactly the same principle that is used by mining engineers in keeping mines supplied with pure air.

One of the most pitiable spectacles in an apiary is to see a hive of bees thoroughly cowed by those of another hive, and standing by while the marauders carry out their honey. Ordinarily, there is a doughty guard at every

Photograph by Paul Henri Fabre

THE END OF A BATTLE BETWEEN SUITORS IN CRICKET LAND

The conquered suitor scampers away, while the conqueror insults him with a song of triumph. The lady cricket looks on very demurely from behind.

bee gate, and whoever would find stolen sweets within that gate may expect a drubbing such as pilferers deserve. But once in a while the occupants of a strong and lusty hive make a foray upon a weak one, and there is a bitter war in which the defenders are worsted. Once cowed by a mass attack, individual enemies seem able to maintain the terrorism, and to carry forward their pillaging at will.

The species reproduced is: Honey-bee (*Apis mellifera* Linn. Plate XII, figures 2, 4, and 9).

Melecta Bee Family (*Melectidae*). This family is made up of two groups, one of which is parasitic. The members of the parasitic tribe are true cuckoos. They have learned that well-known manner of living recorded in Holy Writ, "Reaping where thou hast not sown, and gathering where thou hast not strawed." Some of them single out some industrious species and take up quarters with them uninvited, eating the viands of their hosts as though they were honored guests instead of lazy spongers. Other cuckoo tribes resort to even a lower form of sponging. These watch around until some busy little mason-bee matron gets her nest well-nigh completed and provisioned; then, during her last trip for the final load of provender, they steal into the burrow and lay their eggs in the cell.

Unconscious of what has happened, poor Mrs. Mason-bee lays her egg and closes the cell. But the cuckoo-bee's eggs hatch first, and its larva, eating the ration that never was intended for it, presently grows strong enough to overpower and devour the rightful owner of the cell.

Some species of mason-bees, realizing the purposes of the cuckoos who flourish by nimble wit, never lay an egg in a cell without first having in their mouths the mortar with which to close the cell. If they had to gather the mortar after laying the egg, the plunderer would be the first to improve the opportunity of crossing the unguarded threshold and laying her own eggs in it.

"With the industrious folk who go quietly about their business—the laborers, masons, foragers, and warehousemen—mingle the parasitic tribe, the prowlers hurrying from one home to another, lying in wait at the doors, watching for an opportunity to settle their families at the expense of the honest toilers."

In those words Fabre sums up the situation in Bee Land. Then, bringing the detached view of the philosopher to man's own attitude toward other creatures, he makes one a little more patient with these home destroyers of the insect world by saying, "Life in general is but a vast brigandage.

"Nature devours herself; matter is kept alive by passing from one stomach to another. At the banquet of life, each is in turn the guest and the dish; the eater of to-day becomes the eaten of to-morrow. Everything lives on that which lived or has lived; everything is parasitism. Man is the great parasite, the unbridled thief of all that is fit to eat. He steals the milk from the lamb, he steals the honey from the children of the bee, even as the Melecta bee pilfers the pottage of the Anthophora bee's sons."

The species reproduced are: *Crocisa crucifera* Ckll. (Plate XII, figure 3), occurring in the Philippine Islands; *Triepeolus quadrifasciatus* Say. (Plate XII, figure 11), inhabiting North America.

Anthophora Bee Family (*Anthophoridae*). This family of bees is widely distributed throughout the world. In North America nearly 100 species have been described, but the habits of only a few of these have been studied. The nests of familiar species usually are built in steeply inclined or perpendicular banks of earth, preferably in those of compact clay. Nearly all of the species are gregarious, hundreds of individuals building their nests close together in the same bank of earth. In the construction of their homes the Anthophoras build a cylindrical tube of clay, extending outward and downward from the entrance of the tunnel.

The outside of this tube is rough, but the inside smooth. It is composed of small pellets of earth compacted together, which have been brought out of the tunnel when wet and molded into the desired form. In excavating the tunnel the bees find the clay hard, so they visit a watering place and convert themselves into insectean tanks to carry sufficient supply to the burrow to soften the clay and make it workable like putty.

The Anthophora bees have many foes, before whose attacks they are practically helpless.

The species reproduced is *Anthophora zonata* Linn. (Plate XII, figure 5), found in southern Asia, Malay Peninsula, and Philippine Islands.

TRUE FLIES

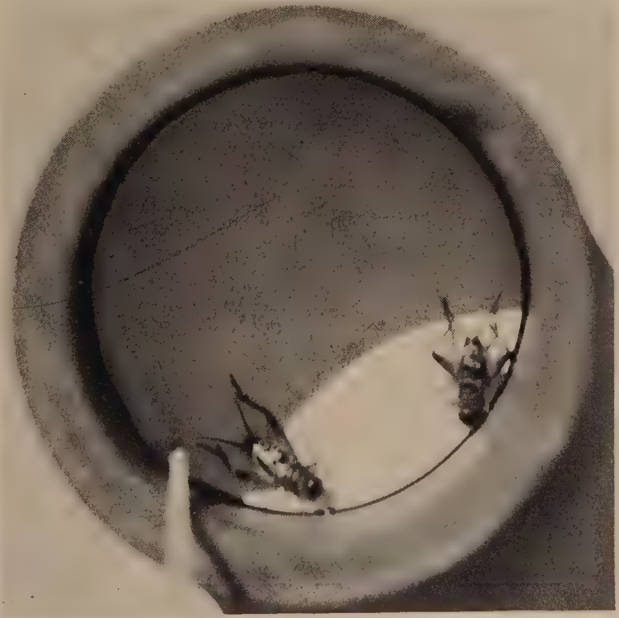
(Order *Diptera*)

Plate XIV

This large order of insects embraces all the two-winged flies, which include the horse

A CHINESE CRICKET ARENA

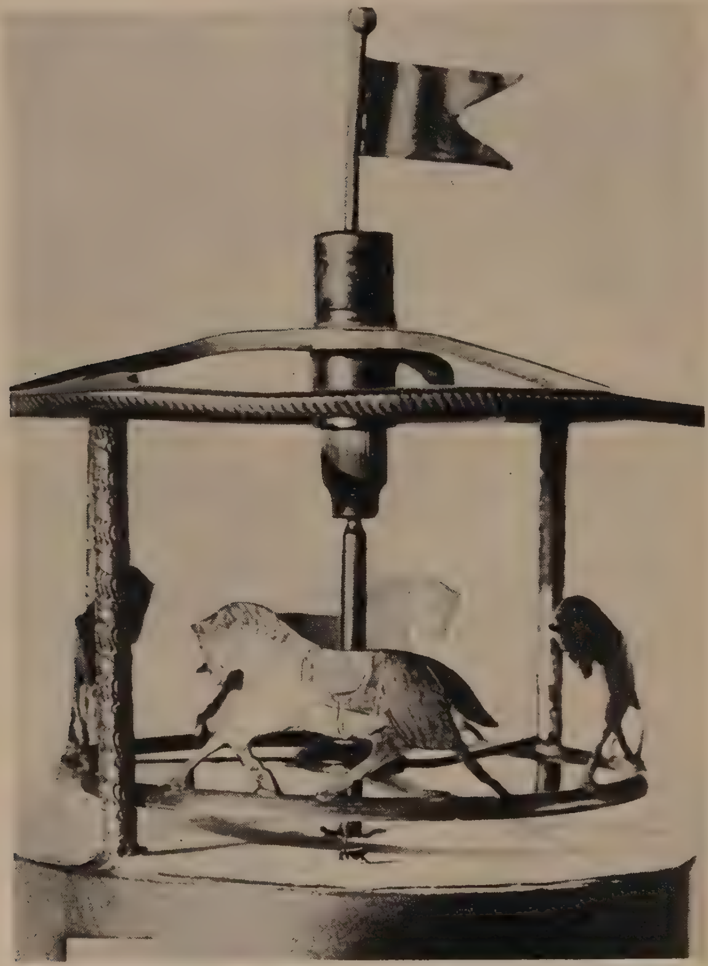
In the bowl is the cricket house with the lid on, at the upper left a food rack with a bean lying beside it, and at the upper right a water trough (see, also, page 63).



Photographs by James Dorsett

CRICKET GLADIATORS

The fighting ring is made of a portion of a large bamboo culm. Betting in China on the results is as lively as that at a horse race or at a game of *jai alai* in Cuba.



Photograph by International

A CHINESE MERRY-GO-ROUND DRAWN BY A FLEA

The tiny bit of motive power is seen in the foreground, under the rim of the wheel. Harnessed to the little toy, the insect is able to move eleven hundred times its own weight. In the United States men have trained fleas to draw tiny wagons and to do acrobatic stunts that make the flea circus a fascinating vaudeville performance.

flies, house-flies, blow-flies, mosquitoes, midges, and gnats, as well as a host of related families. According to Sharp, about 40,000 species have been discovered, but these are only a tithe of those still unknown to science. Aldrich's list of American species now goes far beyond the 8,000 mark.

The *Diptera* are rated by some authorities as physiologically the most advanced of the insects; certainly in them the processes of a complete life cycle are carried on with the greatest rapidity, and the phenomenon of metamorphosis has been most nearly perfected.

A maggot hatching from an egg grows so rapidly that it is mature in a few days; then within an impenetrable skin it dissolves itself almost completely. A little later the liquid content of that skin turns to a sort of jelly, and in a few days this is reconstructed into a being so totally different in appearance, in habits, and in structure, that the resources of science find themselves severely taxed to demonstrate any identity in the organs of the two stages of the insect's existence.

Hover Fly Family (*Syrphidae*). This family is one of the largest and best known among the flies. We see them in our garden, where, when the sun is bright, they hover over flowers or beneath trees where the sun finds its way through the leaves. Many of them mimic bumble-bees, others pattern after honey-bees, and still others imitate the wasps.

It is said that the old myth about the carcasses of animals generating swarms of honey-bees probably arose from the fact that one species of this family so closely resembles the drones that they have been taken for honey-bees. That species breeds in carcasses, and its mistaken identity is found in China and Japan, as well as in Russia. Even the Book of Judges in the Old Testament shows this error of identification in the story of Samson. The majority of species, however, are content to play the simple rôle of an ordinary fly.

The family embraces some 3,000 species distributed all over the world, of which about 300 are represented in our American fauna. Some species live as guests in ants' nests and others dwell with bumble-bees.

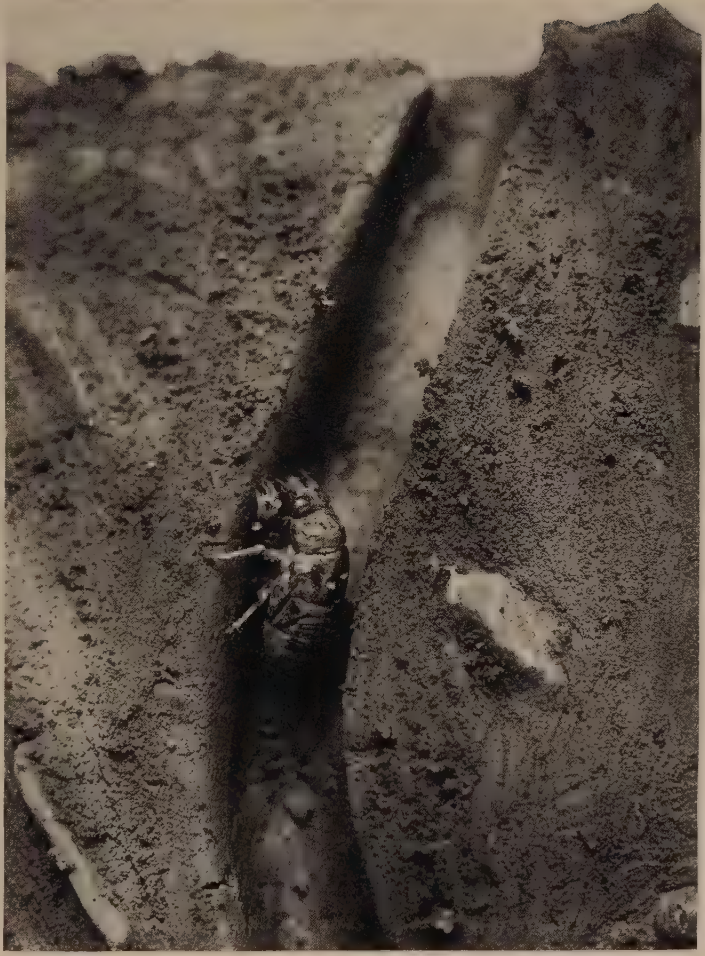
The species reproduced are: Tropical Hover Fly (*Volucella obesa* Fab. Plate XIV, figure 1), common throughout the American Tropics; Florida Ant Fly (*Microdon fulgens* Wiedemann. Plate XIV, figure 3), occurring in Florida; Eastern Hover Fly (*Temnostoma excentricum* Harris. Plate XIV, figure 9), living in the eastern part of the United States; *Milesia virginiensis* Drury. (Plate XIV, figure 10), inhabiting the eastern United States.

Pyrgota Fly Family (*Pyrgotidae*). The members of this family, by many authorities, are placed in the family of Ortalids. Some species of the family are parasitic upon various beetles.

The species reproduced is: May Beetle Fly (*Pyrgota undata* Wiedemann. Plate XIV, figure 2), parasitic upon the May beetle and found in the eastern United States.

Tachina Fly Family (*Tachinidae*). There is no family of the fly order to which man is more deeply indebted than to the Tachina. Its species are practically all parasitic in their habits. Frequenting the flowers and vegetation where other insects gather, they watch their chance to attach their eggs to the skins of young caterpillars and grubs.

When these eggs hatch, the larvæ bore into their victims and live on the tissues. Sometimes the victim is killed before pupation, but usually the parasite's attacks are not fatal so soon, and pupation takes place. Later the parasite grub itself pupates within the carcass of its victim and then emerges a full-fledged fly. Many species of this family help to hold in check the great hosts of army-worms, locusts, and other of our worst insect foes, which otherwise would overwhelm a community. A single species is almost the only check on the destructive flower-eating Diabrotica of California, which, Kellogg tells us, if allowed to increase unhindered, soon would destroy every blossom in that land of flowers.



Photograph by Paul Henri Fabre

THE LARVA OF A CICADA IN ITS BURROW

The females of innumerable species of insects lay their eggs in the ground. When these hatch the larvæ dig themselves burrows in which they remain, usually until a short time before they are ready to develop wings and fly away in the adult stage of their life cycle. Many other species lay their eggs in fruits, nuts, and branches. When these fall to the ground the larvæ emerge and dig into the soil, where they make cells in which they sleep until the metamorphosis is complete.

More than 1,400 American species have been reported in our fauna. Some species give birth to live larvæ instead of laying eggs. The skin of the prospective host is punctured by the viviparous female with her ovipositor and her larvæ deposited within the body of the host. In the case of *Eupeleteria magnicornis,* which infests the larvæ of the brown-tail moth, the female attaches its larva to the surface of a leaf by a thin membranous case which is cup-shaped and surrounds the anal end of the larva. The little maggot reposes on the silken thread which the caterpillar uses as a guide back to its nest, lying in wait until the victim returns from the feeding ground.

The species reproduced are: Eastern Tachina Fly (*Belvesia bifasciata* Fab. Plate XIV, figure 4), occurring in eastern and southern United States; Western Tachina Fly (*Paradejeania rutiloides* Jaennicke. Plate XIV, figure 5), inhabiting the western part of the United States.

Bot Fly Family (*Oestridae*). Although this family consists of fewer than 100 species in the whole world, it is one of much interest on account of the habits of its members, which, though large in size, live entirely at the ex-

Photograph by Lynwood M. Chace

BLACK-AND-WHITE PAPER WASPS IN THE DARK CORRIDORS BETWEEN TIERS OF CELLS

The wasps never have been able to solve the problem of a year-to-year existence of their colonies, as have some of the bees and ants. Each fall the community dies out, and only a few fertilized females, which have hibernated as adults in sheltered places, such as crevices in stone walls and protected spots under logs, are able to survive the winter. When spring comes these reawaken into an active life and make themselves small nests containing a few brood cells. From these humble beginnings the summer colonies grow.

pense of living vertebrates. Some dwell in the alimentary canals of their hosts, others occupy the respiratory passages, and still others live beneath the skin of the animals they attack. Some species of the bot fly family in the Tropics are parasitic on monkeys and even have been reared from human beings.

The Ox Warbles are aliens from Europe. They attach their eggs to cattle, usually on the hind legs and occasionally on the flanks. When the larvæ hatch they crawl down the hair follicle and penetrate the skin. In their second stage they are found in the wall of the esophagus. The exact course from the hind legs to the esophagus has not been determined, but it is believed that the larvæ probably travel in the loose connective tissues under the skin to the region of the throat and into the esophagus. Here they remain for three months and then migrate to the back, where they finally emerge through holes in the skin.

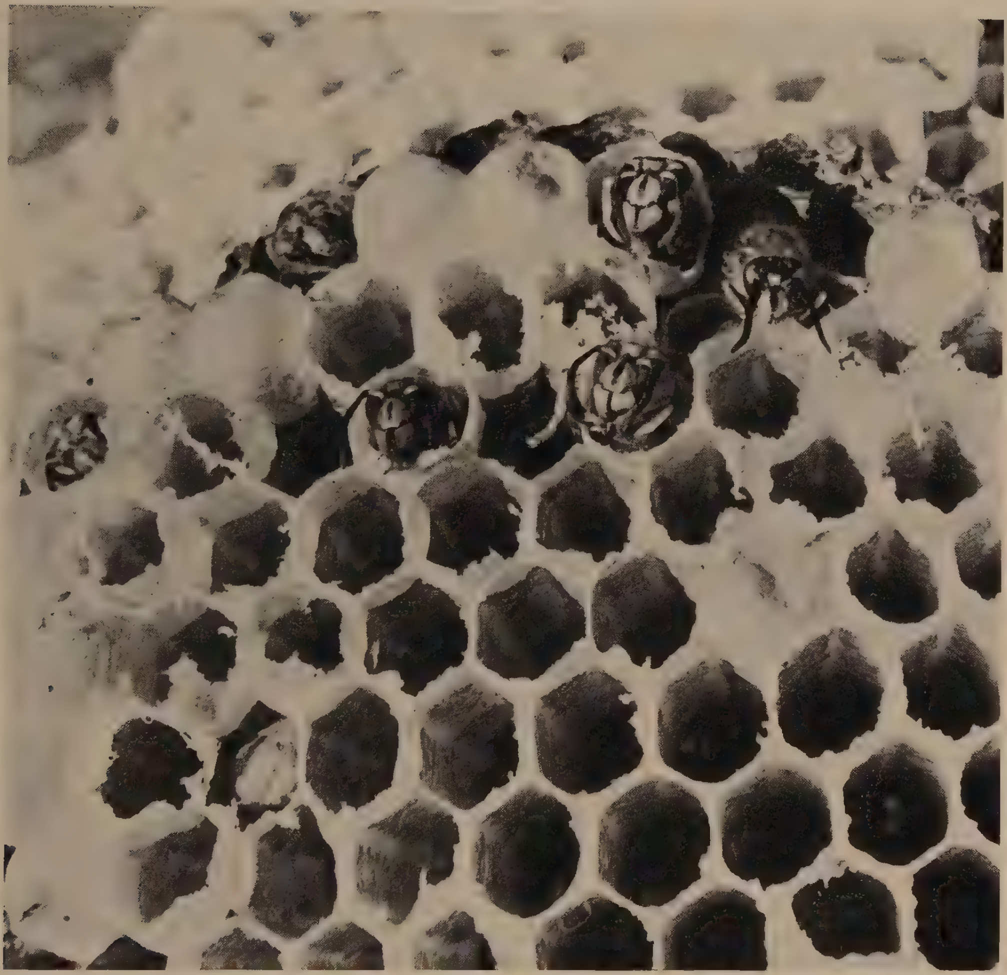
The horse bot fly is well known to every lover of horseflesh. During the summer time it flies about the forelegs of horses, laying its eggs on the long hairs above and below the knee joints.

These eggs rarely hatch when left untouched, but the horse, by scratching the legs with its teeth, removes the small cap of the eggshell and inadvertently takes the larvæ into its mouth. The latter then are carried with food or water into the stomach, where they fasten themselves to the inner coating and remain until full grown. Horses have an instinctive fear of the gad fly, as the adult more popularly is called.

The species reproduced are: Central American Bot Fly (*Dermatobia hominis* Linn. Plate XIV, figure 6), habitat Central America; Ox Warble (*Hypoderma lineatum* DeVilliers. Plate XIV, figure 8), occurring in eastern and southern United States.

Blow-fly Family (*Calliphoridae*). The most familiar members of this group are the blue-bottle and green-bottle flies. The blow-flies live normally out-of-doors, but often enter houses in search of material on which to deposit their eggs. Their larger size and loud buzzing, as well as their striking hues, make them conspicuous in any fly company. They lay their eggs on meat, cheese, and other provisions. These soon hatch and their larvæ rapidly develop.

It seems rather strange that until only a few centuries ago maggots were supposed to be the product of spontaneous generation. Then some early scientist decided to spread a piece of fly



Photograph by Lynwood M. Chace

CELLS OF A BLACK-AND-WHITE PAPER WASP

From some of the cells the young wasps have emerged, in others they are getting their first view of the world round about, and in still others the occupants remain undisturbed by the events of their community. The seals of their living tombs have not yet been broken, but presently the day of emergence will arrive, and, biting away the coverings, they will come forth full-panoplied for a short and merry life of a few weeks.

netting above a block of cheese so that the flies could hover about the cheese but not reach it. They thereupon laid their eggs upon the netting and these in due time produced the usual larvæ of maggots, and the ghost of spontaneous generation was banished for a long time. But when bacteria were discovered it came back, and so strenuously asserted itself that faith in it was held firmly in many quarters until Pasteur, through a long series of experiments, thoroughly put it to rout as an explanation even of the minutest form of life.

The species reproduced are: Scavenger Fly (*Silbomyia fuscipennis* Fab. Plate XIV, figure 7), from Java; Costa Rican Blow-fly (*Mesembrinella umbrosa* Aldrich. Plate XIV, figure 14), from Costa Rica.

Robber Fly Family (*Asilidae*). More than 3,000 robber fly species have been described, of which 500 are found in our fauna. Some are short, thick, and extremely hairy, superficially resembling bees and bumble-bees, but the majority of them are long and slender. As is the case with most insects which feed upon other insects, the robber flies are a ravenous host. A single individual has been observed to kill eight moths in 20 minutes.

They are fierce foes and seem to fear nothing. The stronger species will attack wasps and other stinging insects, and have been observed to capture dragon-flies and tiger-beetles. The larvæ of most species are like the adult flies in their predaceous habits. They feed upon

Photograph by Herbert

GRASSHOPPER GUESTS OF THE U. S. S. "MINDANAO"

When America's new Yangtze River gunboat reached a point a thousand miles from the Yellow Sea, a huge swarm of grasshoppers swooped down, rested a while, and then took wing again. Many species of insects have colonized the whole world by becoming stowaways aboard the ships that sail the seven seas.

other larvæ in rotting wood, under bark or fallen leaves, or in loose soil.

The species reproduced is: California Robber Fly (*Laphria coquilletti* McAtee. Plate XIV, figure 11), found in California.

Nimble Fly Family (*Dexiidae*). This family possesses about 50 species in this country. The legs of the American species are usually long, and in their early stages our nimble flies are parasitic on various insects, especially beetles. Snails also are known to be forced to act as hosts for their larvæ.

The species reproduced is: Australian Nimble Fly (*Rutilia splendida* Donovan. Plate XIV, figure 12), found in Queensland, Australia.

Ortalid Family (*Ortalidae*). This is a small family which possesses a number of American species. In the larval state they usually occur under the bark of pine and poplar trees, in the burrow of wood-boring insects, and in onions, cotton bolls, and apples. Most species are regarded merely as scavengers, but some are parasitic on caterpillars.

On the whole, the American Ortalids are a group of insects that have few foes and many friends.

The species reproduced is: *Achias amplividens* Walker. (Plate XIV, figure 13), occurring in Australia.

THE LITTLE MOTHS

(Order *Micro-lepidoptera*)

Plates XV and XVI

Among the *Micro-lepidoptera* are some of the worst pests of the whole insect world. The Psyche moth, which in its larval stage is known as the bagworm, belongs to this order. So do the green slug-moth, with its bright scarlet caterpillar; the hag-moth, which gets its name from the disheveled appearance of its larva; the raspberry root-borer and the peach-tree borer, which are such foes of the berry patch and the peach orchard; the bee-moth, the flour- and meal moths, the clothes-moth, the codling moth, and many others of their ilk.

Olethreutidae Family. More than 400 North American species of this family have been described. Perhaps its most disliked member is the codling moth, whose larvæ are the nasty little worms too frequently found feeding near the core of apples. The grape berry moth, which is the most common cause of "wormy" grapes, also belongs to this group, as do the apple bud moth and the clover seed moth.

The species reproduced are: European Pine Shoot Moth (*Rhyacionia buoliana* Schiffermuller. Plate XV, figure 1), a native of Eu-

Photograph by Paul Henri Fabre

LONG-HORNED BEETLES ON A LOG

Some wood-boring beetles spend their larval stage in the heart of oak trees, while others spend this period driving mines between the bark and the wood. The latter species are known as engraver beetles. One tiny member of the order has been a source of much trouble to transcontinental telephone cables. They bore through the lead sheathing, thereby admitting moisture and destroying the insulation.

rope, also found in New York; Virginia Pine Moth (*Petrova virginiana* Busck. Plate XV, figure 3), found in Virginia and eastern United States; *Grapholitha egregiana* Felder. (Plate XV, figure 16), found in the Solomon Islands.

Oecophoridae Family. The *Oecophoridae* moths embrace about 100 American species of rather diverse habits, most of which, in their larval stages, live in webs or feed in decayed wood. Perhaps the most familiar species is the parsnip web moth, whose larvæ web together and devour the unfolding flower heads of celery, parsnip, and wild carrot. After having consumed the flowers and unripe seeds and become nearly full-grown, they burrow into the hollow stems of the plants, feed upon the pith and then pupate.

The species reproduced are: *Lupercalia ignita* Busck. (Plate XV, figure 2), occurring in Panama; *Filinota hermosella* Busck. (Plate XV, figure 6), habitat French Guiana; *Phytomimia chlorophylla* Walsingham. (Plate XV, figure 18), inhabiting Guatemala; *Hypercallia miniata* Dognin. (Plate XVI, figure 4), habitat Ecuador.

Cosmopterygidae Family. In spite of the fact that this family has no common name, some of its members are well known. One of these is the Palmetto Leaf-miner, which lives on the saw palmetto. Its larvæ are social, working together in small companies. They make nests consisting of a delicate sheet of silk covering that part of the leaf upon which they are feeding. The cattail moth, which infests the heads of cattail plants, is another member.

The species reproduced are: *Psacaphora edithella* Barnes & Busck. (Plate XV, figure 4), occurring in Colorado; Palmetto Leaf-miner (*Homaledra heptathalama* Busck. Plate XV, figure 5), inhabiting Florida.

Gelechiidae Family. This family includes a number of our worst pests and possesses more than 400 species. Some are leaf-miners, others attack the heads and bolls of plants, and still others prey upon stored grain. The Angoumois grain-moth, whose larvæ feed within the seeds of oats, rye, wheat, barley, sorghum, and cow peas, and the pink boll worm, which is one of the worst of our insect pests, are the outstanding members of the family. The peach twig borer, which burrows into the tender shoots of the peach tree in early spring, and the goldenrod gall moth, whose larvæ cause the galls in the stems of goldenrod, also belong to this group of *Micro-lepidoptera*.

The species reproduced are: *Atasthalistis tricolor* Felder. (Plate XV, figure 7), living in

Photograph by Paul Henri Fabre

TWO INSECT WEATHER PROPHETS CONFER (SEE TEXT, PAGE 14)

These green grasshoppers are close relatives of the katydids. The males sing both by day and by night. The eggs of most species are laid usually in the stems of root leaves of grasses or the pith of twigs.

the Solomon Islands; *Atasthalistis concinnalis* Feisthamel. (Plate XVI, figure 3), occurring in New Guinea.

Hyponomeutidae Family. This is another family of *Micro-lepidoptera* which is somewhat noted for its pest species. One of them is the apple fruit miner, which has developed into a serious menace in orchards in western Canada. It burrows in all directions through the fruit, causing it to decay. The family also embraces the ailanthus web-worm moth and the ermine moth. One species of the latter has been introduced into the United States and is becoming an apple and cherry pest.

The species reproduced are: *Mieza citrina* Busck. (Plate XV, figure 8), living in Costa Rica; *Mieza laetae* Hubner. (Plate XV, figure 10), occurring in Guatemala; *Mieza spatula* Busck. (Plate XV, figure 11), living in Costa Rica; *Atteva exquisita* Busck. (Plate XV, figure 13), a native of Mexico; *Atteva hysginiella* Wallengreen. (Plate XV, figure 17), inhabiting the Galápagos Islands; *Atteva pustulella* Fab. (Plate XV, figure 20), an inhabitant of San Salvador; *Lactura conflagrans* Walker. (Plate XVI, figure 2), occurring in New Guinea; *Pseudotalara regia* Schaus. (Plate XVI, figure 5), occurring in Mexico.

Glyphipterygidae Family. This family is of world-wide distribution. There are about 40 species which belong to it in the North American fauna.

The species reproduced are: *Tortyra cuprinella* Busck. (Plate XV, figure 9), occurring in Panama; *Hemerophila albertiana* Stoll. (Plate XV, figure 12), native of British Guiana; *Mictopsichia durranti* Walsingham. (Plate XV, figure 19), native of Guatemala.

Adelidae Family. The tiny moths of this family in their larval stage feed on the leaves of various herbs and shrubs. In their earliest stages the larvæ are miners, but later they live in portable cases. The male members of the family are characterized by the unusually long and fine antennæ, which may be twice or more than twice the length of the wings.

The species reproduced is: *Nematois chrysoprasias* Meyrick. (Plate XV, figure 14), occurring in Assam.

Ethmiidae Family. The larvæ of this family are usually social, living in a light web and feeding chiefly on plants of the borage family. Most of the American species belong to the genus *Ethmia.*

The species reproduced is: *Ethmia festiva* Busck. (Plate XV, figure 15), found in Guatemala and Panama.

Tineidae Family. Some 4,000 species of this family, which includes among others the

Photograph by Paul Henri Fabre

A BEETLE DRAGS A CICADA INTO ITS BURROW

The most striking hunters of the insect world belong to the wasp clan. However, many of the beetles are also carnivorous.

clothes-moths and many of the leaf-miners, have been described, of which 125 have a North American habitat. Each of the three species of clothes-moths belongs to a different genus, and all of them came with the American people from the Old World. One of them is the parent of the case-bearing larva.

Whenever this larva grows too large for its little case, it expands its home without emerging therefrom. Cutting a triangular slit down one side, in the one end it inserts triangular gores of the woolen material upon which it is feeding, after which it turns around and enlarges the other end in the same way. That process takes care of the diameter, but not the length of the case. To make it longer, each end is opened and an addition is built.

The web clothes-moth makes no case, but hides in a fold or crevice of the material it is eating and spins a little web of silk to cover it. The third species is found in fur robes, horse blankets, upholstering, and the like. Species of the genus *Stigmella* are mostly leaf-miners. The leaves of Juneberry, oak, chestnut, hazel, walnut, sycamore, ironwood, apple, wild cherry, sweetbrier, and blackberry each have their own special species of these miners.

The species reproduced is: *Coryptilum klugii* Zeller. (Plate XVI, figure 1), found in New Guinea.

Tortricidae Family. This large family, mostly made up of leaf-rollers, possesses about 165 North American species. The *Cacoecia* include the rose ugly nest, the cherry tree ugly nest, the oak ugly nest, and the fruit tree ugly nest, the latter being much of a nuisance in orchards. The eggs are laid on the bark of the twigs in June. The larvæ hatch in May of the following year and enter the opening buds.

The species reproduced are: *Cerace onustana* Walker. (Plate XVI, figure 6), found in Japan; *Pseudatteria leopardina* Butler. (Plate XVI, figure 7), occurring in Costa Rica; *Pseudatteria mimica* Felder. (Plate XVI, figure 9), habitat Brazil; *Megalodoris electrina* Meyrick. (Plate XVI, figure 12), living in the Philippine Islands; *Tortrix animosana* Busck. (Plate XVI, figure 14), occurring in Guatemala.

Clear Winged Moth Family (*Aegeriidae*). This is a small family of unorthodox *Microlepidoptera*, since many of them have no scales on their wings and some of them only a few. Likewise they depart from the moth habit in being day rather than night flyers. The majority of the species of the family mimic bees, wasps, and flies. This mimicry is not a superficial one, since even the motions of the insects captured or disturbed closely resemble those of the ones they imitate. Their attitude while resting, the sounds they produce, their hyaline wings, the rings on their bodies, even the odors they give off, stamp them as being what they are not. Some of them carry the deception so far that they even pretend to sting, and go

Photograph by Paul Griswold Howes

AN ASSASSIN-BUG FEEDING ON A CAPTURED INSECT

These hairy-legged creatures feed mainly on other insects, but have been known to bite human beings. The kissing bugs, which occupied so much space in the newspapers several decades ago, belong to this family. The hairs on their bodies are often sticky, and particles of dust, lint, and other material adhere to them, practically concealing them. Its appearance has given to one of the species the common name of masked bed-bug hunter (see text, page 41).

through all the motions of doing so, although they are entirely lacking in the necessary organ for that purpose.

The larvæ of the family are all borers. One of them, *Sanninoidae exitiosa*, is the worst of all the peach-tree borers, and is estimated to damage the peach crop to the extent of $6,000,000 a year. While it formerly preyed on wild cherries and plums, it later adopted the peach tree.

The species reproduced are: *Paranthrene palmi* Harry Edwards. (Plate XVI, figure 8), occurring in New York State; Western Clear Winged Moth (*Melittia gloriosa* Harry Edwards. Plate XVI, figure 11), living in Oregon.

Plutellidae Family. This family is of wide distribution, with about 50 North American species. The most familiar member is the diamond back moth whose larvæ infest cabbage and other cruciferous plants, eating holes in the leaves. The moth is sometimes a pest in greenhouses, infesting stocks, wallflowers, sweet alyssum, and candytuft.

The species reproduced is: *Imma grammozona* Meyrick. (Plate XVI, figure 10), habitat New Guinea.

Stenomidae Family. This family possesses some 20 North American species and has a rather wide distribution. The larvæ live in webs, most frequently infesting the oak.

The species reproduced are: *Stenoma elegans* Zeller. (Plate XVI, figure 13), occurring in Peru; *Stenoma armata* Zeller. (Plate XVI, figure 15), inhabiting Paraguay.

THE BEETLES

(Order *Coleoptera*)

Plates XVIII to XXIV inclusive

The beetles are the predominant order of the insect world. The transformation of what was once their forward pair of wings into wing cases makes them poor flyers, but it gives them a protection that has brought prosperity to their kind. The order consists of about 150,000 known species, which are grouped in upward of 80 families. Although representatives of nearly all of these families are to be found in our fauna, less than 40 families contain the species that are familiar to most of us. Among the families not illustrated are those to which belong the fireflies, curculios, bark-beetles, grain beetles, burying beetles, death-watch and drug-store beetles, rove beetles, water pennies, and whirligigs.

Tortoise Beetle Family (*Cassididae*). These beetles get their name from the striking

Photograph by George R. King

TENT-CATERPILLAR NESTS IN WESTCHESTER COUNTY, NEW YORK

The larvæ of many species of moths, butterflies, and *Micro-lepidoptera* are gregarious in their habits and build community nests, where they stay together until time to pupate. Then they become individualistic again and each goes its own way.

similarity of their shape to that of the tortoise. Many of them possess striking colors in life which incline to fade in death. To this family belong the striking argus and the brilliant gold-bug. Beautiful as are the adults, their grubs are ugly and disagreeable in the extreme. They possess taillike forks at the end of the body, upon which is heaped their excrement and cast skins, used as a sort of shelter.

Each successive molt brings a new cast skin to the shelter, which gradually comes to resemble a pack, so that the grubs become known as peddlers. The gold-bug seems to possess some of the characteristics of the chameleon. Sometimes it appears in a dull yellow costume and at others in an armor that shines like burnished gold. At still other times it is arrayed so that it presents the variable tints of pearls.

The species reproduced are: *Desmonota variolosa* Web. (Plate XVIII, figure 1), from Bahia; *Tauroma casta* Boh. (Plate XVIII, figure 4), native of Costa Rica; *Omaspides bistriata* Boh. (Plate XVIII, figure 15), occurring in Colombia, Venezuela, and Costa Rica; *Dolichotoma bisbiplagiata* Boh. (Plate XVIII, figure 16), habitat Guatemala; *Aspidomorpha miliaris* Fab. (Plate XVIII, figure 17), habitat the Philippines, New Guinea, Yünnan, and Tonkin; *Mesomphalia beatula* Boh. (Plate XVIII, figure 21), occurring in Brazil.

Leaf Beetle Family (*Chrysomelidae*). There are some 18,000 known species in this family, nearly 1,000 of which occur in our North American fauna. It includes the long-horned leaf beetles, the 3-lined potato-beetle, the asparagus beetle, the grape root worm, and the familiar Colorado potato beetle. The latter is the largest species of the family, and the damage it does to potato leaves is typical of the ravages of the family on different forms of foliage on which the several species feed.

The story of the spread of the Colorado beetle constitutes one of the most surprising adventures of an insect species in American entomological history. When civilization moved west to Colorado it found there, feeding on sand burs, a yellow- and black-striped beetle with a disgusting odor, but with no hint of its deadly possibilities.

About 1850 it began to cultivate a taste for potato leaves; nine years later it had spread to Nebraska, reached Iowa at the beginning of the Civil War, and crossed the Mississippi the summer that Lee surrendered at Appomattox. It then spread eastward, and by the centennial year had succeeded in forcing the barriers of the Alleghenies and reaching the Atlantic seaboard. Europe was heartily alarmed when a few of them sailed across the Atlantic as stowaways, but prompt preventive measures and rigid quarantine have prevented them from colonizing the world's principal potato-growing continents.

The species reproduced are: *Leptinotarsa 10-lineata* Say. (Plate XVIII, figure 2), habitat Canada to Costa Rica; *Leptinotarsa flavitarsis* Guer. (Plate XVIII, figure 3), occurring in Guatemala; *Lema trilineata* Oliv. (Plate XVIII, figure 9), habitat North America and the West Indies; *Doryphora flavozonata* Blanch. (Plate XVIII, figure 18), habitat Bolivia; *Doryphora kollari* Stal. (Plate XVIII, figure 19), occurring in Brazil; *Doryphora mirabilis* Stal. (Plate XVIII, figure 20), habitat Mexico and Guatemala; *Doryphora flavozonata* Blanch. (Plate XIX, figure 1), native of Bolivia; *Sagra Borneoensis* Lac. (Plate XIX, figure 2), native of Borneo, and ranging all through the oriental region; *Sagra fabricii* Lac. Plate XIX, figure 10), habitat Java.

Metallic Wood-borer Family (*Buprestidae*). There are some 5,000 known species of metallic wood-borers, or Buprestids, in the world, of which about 200 are found in America. Many of them are among our most showy beetles, their metallic wing cases often being rich in brilliant iridescence. The wing cases of some eastern species are a brilliant green, and are used for dress trimmings. South American Indian chieftains often make anklets of the bronze wing cases of a gigantic South American species.

The larvæ of the larger species of Buprestids are nearly all wood-borers. They usually live under bark, and make broad, shallow burrows, galleries, and chambers.

So regular are their habits of burrowing that a trained entomologist can recognize the species that made the traceries long after they are gone, just as a bank teller recognizes the signature of a customer. Their bodies are long, somewhat flattened, the forward segments so joined with the small head as to make them appear to possess large, flat heads—hence their popular name of hammer-heads and flat-headed borers.

The most injurious of the Buprestid beetles is the flat-headed apple-tree borer, which prefers apple trees, but makes itself at home in many other kinds. The adults appear about May, and are a dull, metallic brown, except the abdomen, which is a rich, metallic greenish blue. The young larvæ build their nests in the soft sapwood, but as they grow older, bore deeper into the heartwood where they hibernate. In the spring, they bore back almost to the surface, where they build their pupal cells in which to undergo the sleep out of which they shall awaken full-fledged beetles.

Another injurious Buprestid is the peach-tree borer. With wing cases that look like hammered copper, it is a beautiful creature. Still another is the red-necked cane-borer which causes the "gouty galls" on blackberries and raspberries. The adults emerge in May or June, and lay their eggs where the leaf axil joins the stem. Their larvæ girdle the stem, and by early August the galls begin to form, if the girdling operation has been successful.

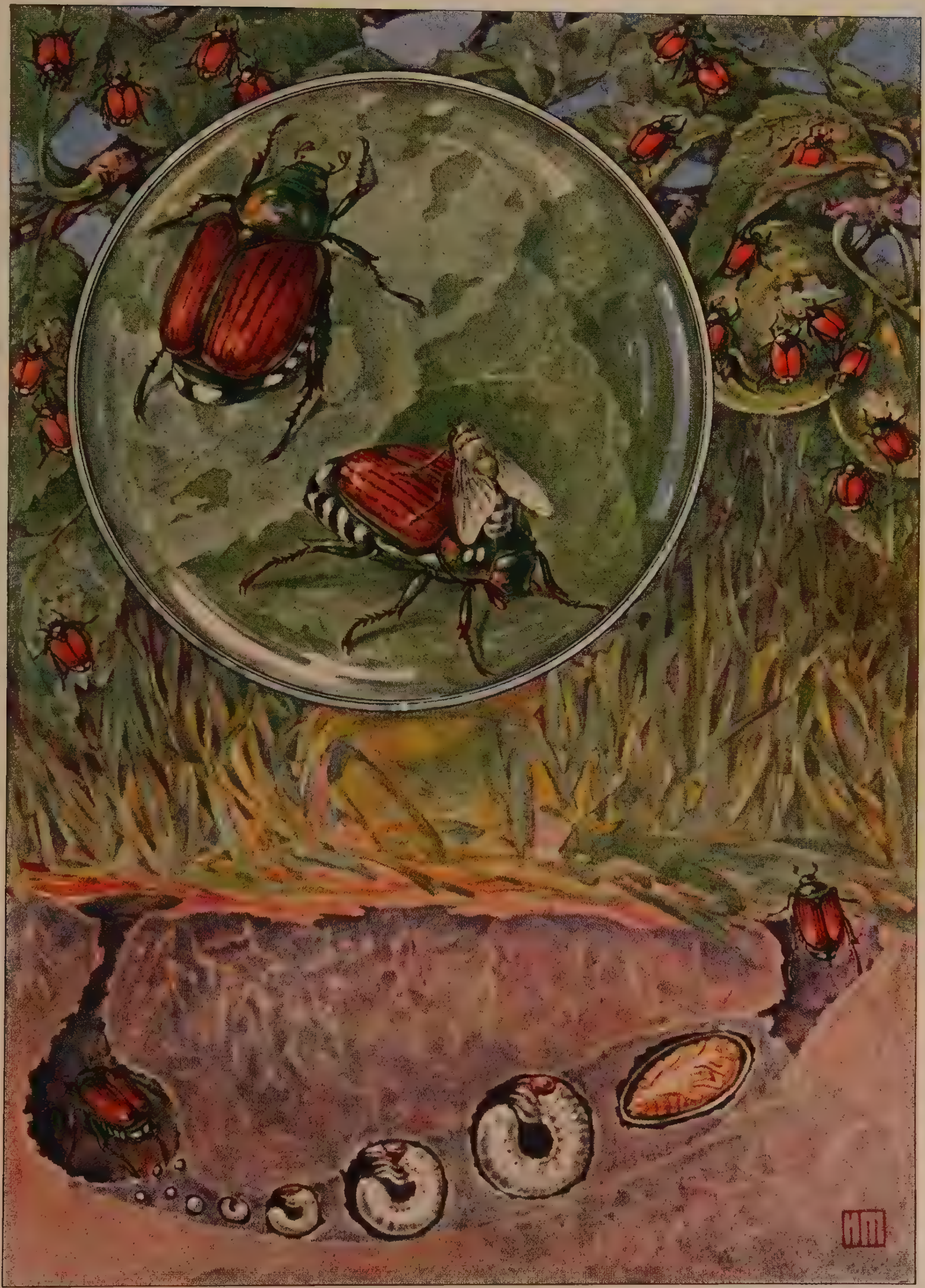
The larvæ spend the winter in the gall, or, if none has been formed, burrow into the pith of the brier stem. Many of the larger American Buprestids are particularly fond of pine trees, and prey on conifers exclusively. Some of the smaller species are leaf-miners.

The species reproduced are: *Chrysobothris femorata* Oliv. (Plate XVIII, figure 5), a North American species; *Julodis viridipes* Cast. (Plate XIX, figure 5), occurring in Africa; *Hyperantha haemorrhoa* Fairm. (Plate XX, figure 6), a South American species, living especially in Venezuela; *Psiloptera bicarinata* Thunbg. (Plate XX, figure 7), occurring in French Guiana; *Stigmodera variabilis* Don. (Plate XX, figure 8), habitat Australia; *Buprestis rufipes* Oliv. (Plate XXI, figure 2), habitat eastern United States; *Buprestis aurulenta* Linn. (Plate XXI, figure 3), occurring in northwestern United States; *Chrysochroa fulgidissima* Schoenh. (Plate XXI, figure 14), a Japanese species; *Sternocera bennigseni* Kerrem. (Plate XXII, figure 1), habitat Africa; *Sternocera hunteri* Waterh. (Plate XXII, figure 3), habitat Africa; *Conognatha amoena* Kirby. (Plate XXII, figure 4), habitat Brazil; *Belionota sumptuosa* Cast. & Gory. (Plate XXII, figure 6), habitat Malaysia; *Chrysochroa buqueti* Gory. (Plate XXII, figure 7), habitat Indo-China and Java; *Chrysochroa edwardsi* Hope. (Plate XXII, figure 8), occurring in southern Asia; *Stigmodera macularia* Donovan. (Plate XXII, figure 9), habitat Australia; *Chrysochroa ocellata* Fabricius. (Plate XXII, figure 10), habitat southern Asia; *Stigmodera suturalis* Donovan. (Plate XXII, figure 11), an Australian species.

Meloid Beetle Family (*Meloidae*). The Meloid beetles, of which there are some 1,500 known species, including the 200 that are American, have a fascinating life history. Some species prey on bees, others on locusts, and still others on divers forms of insect life. The one parasitic on locusts lays its eggs in spots frequented by the locusts. In a few days these hatch, and the baby Meloes proceed early and actively with their prime business of finding a host. Crawling around in large numbers, locust egg deposits soon are found, and presently most of the eggs become provender for the wandering host. After a preliminary feast the youngster makes seven different changes before reaching the adult stage. At one point a change results in a retrogression in its climb to adulthood.

The species reproduced are: *Epicauta vittata* Fab. (Plate XVIII, figure 6), found in North America; *Tegrodera aloga* Skinn. (Plate XIX, figure 7), habitat California; *Zonabris oculata* Thunbg. (Plate XIX, figure 8), a South African species.

Long-horned Beetle Family (*Cerambycidae*). There are about 13,000 species of long-horned beetles in the world, of which some 600 belong to North America. They include such pests as the round-headed apple-tree borer, the oak pruner, and the twig girdler.



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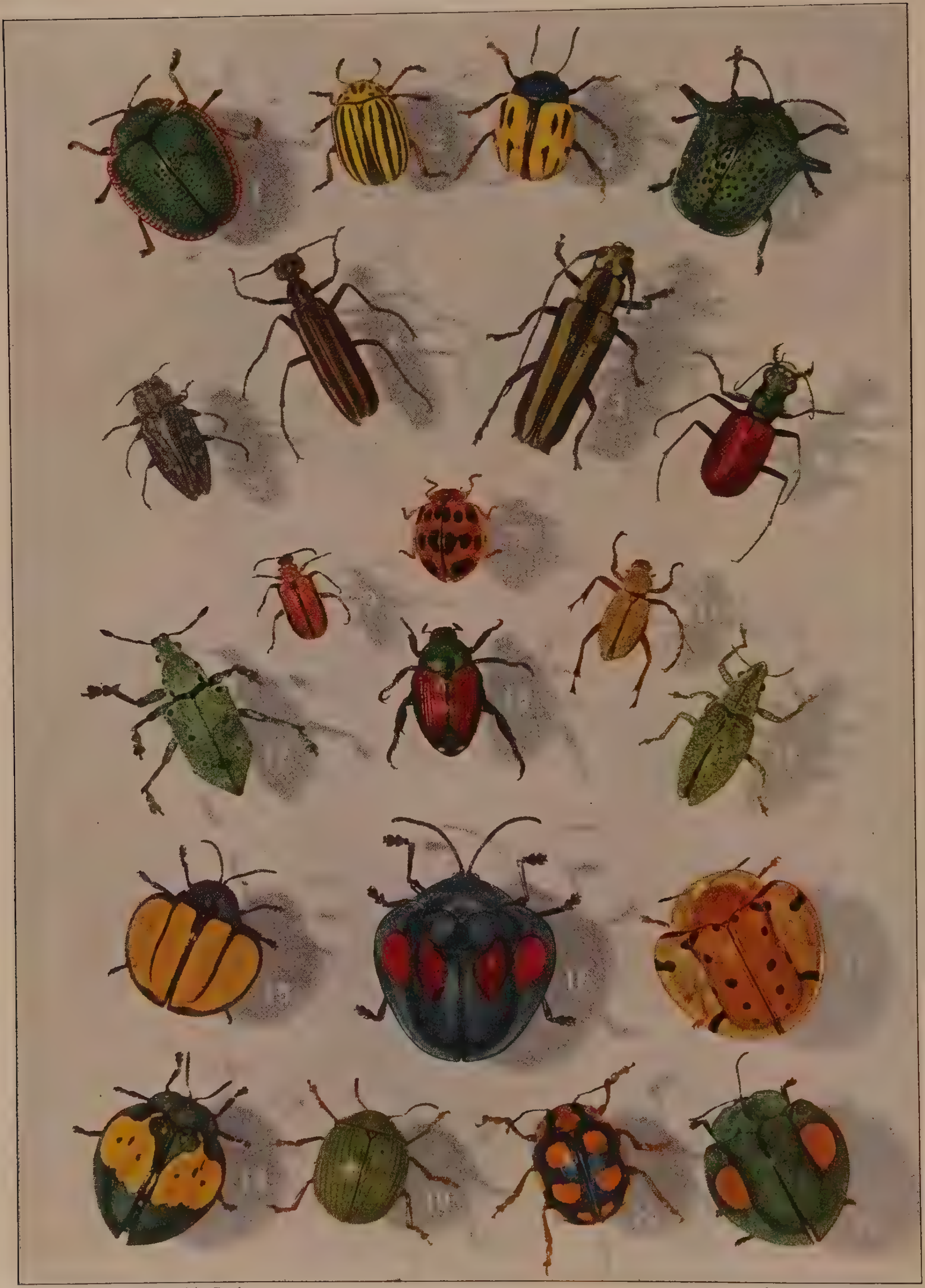
Painting by Hashime Murayama

THE JAPANESE BEETLE AND THE HIGH SPOTS OF ITS CAREER

The story of the career of this newest of our American pests is broadly typical of the whole Beetle Order. Not all of them spend their larval stages in the ground, however. The parasitic fly shown on the magnified female beetle was imported by the United States Bureau of Entomology. In Japan it and other parasites have been able to prevent the beetle from becoming a menacing pest. The entomological name of the Japanese beetle is *Popillia japonica* and of the fly parasitizing it *Centeter cinerea*. The beetles at the top of the main picture are natural size; those under the magnifying glass are 4½ times natural size; those at the bottom are 1½ times natural size.



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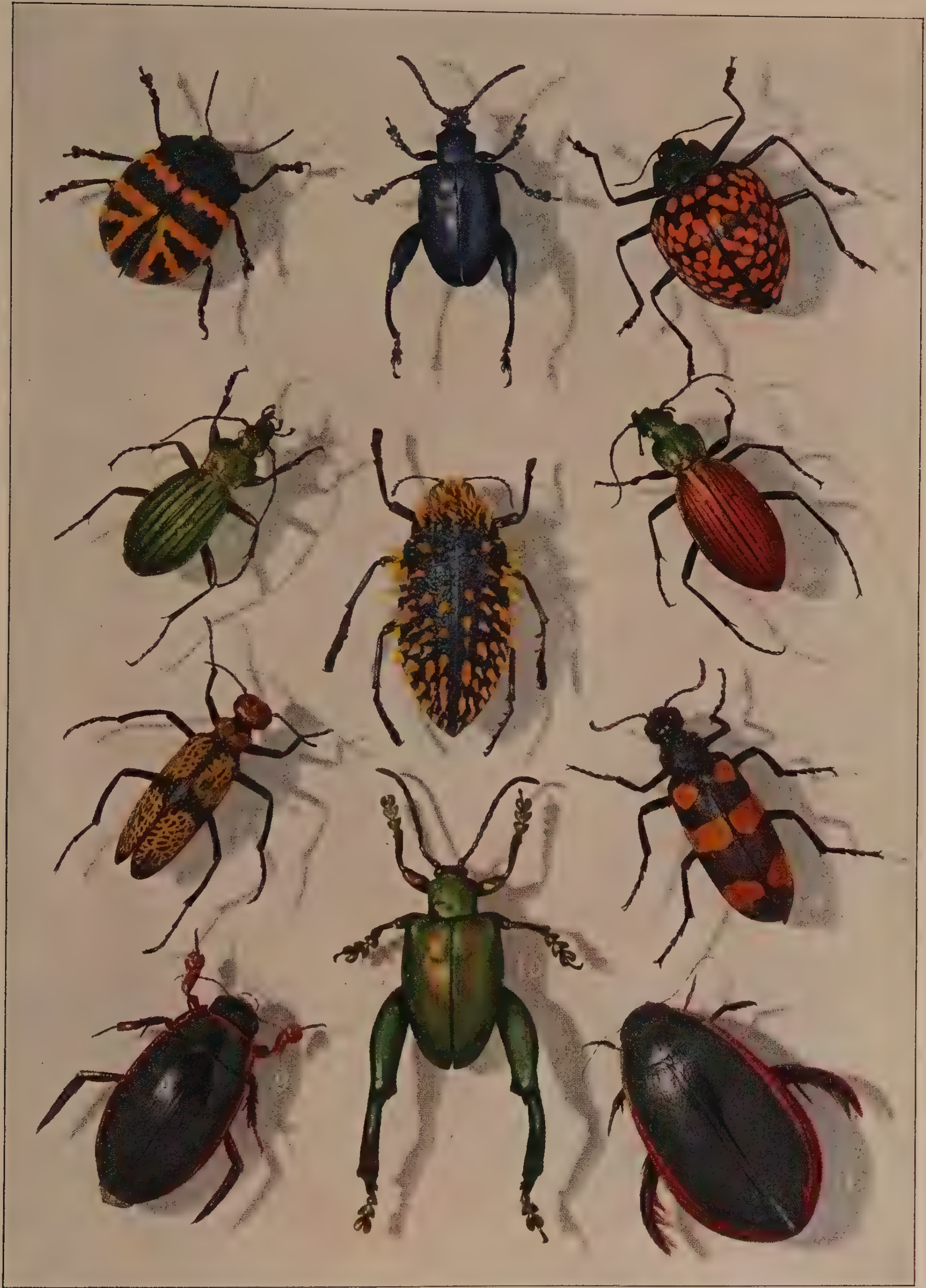
Twice Natural Size

LIVING JEWELS THAT MOCK THE LAPIDARY WITH THEIR BEAUTY

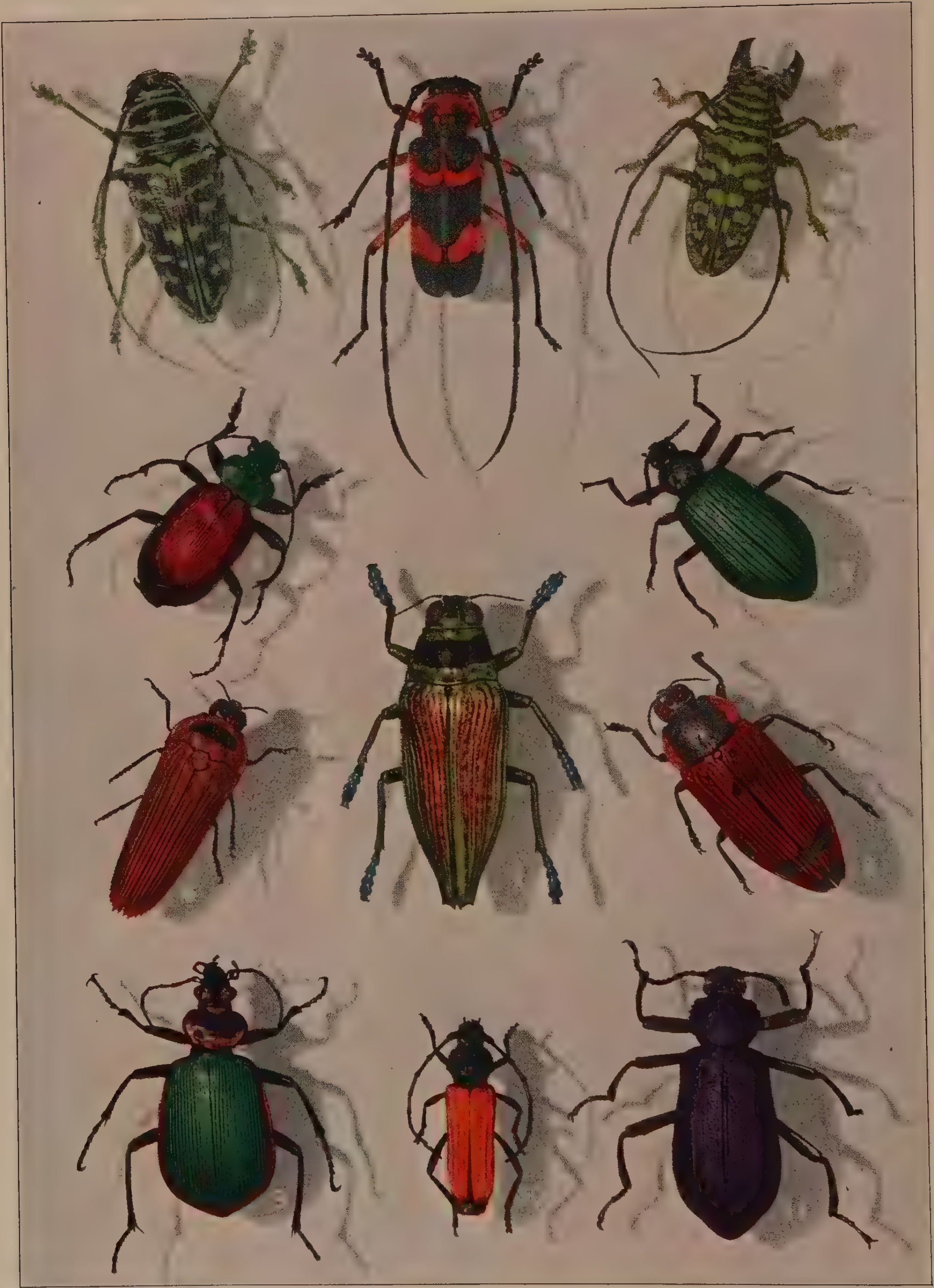
(1) *Desmonota variolosa* Web.; (2) *Leptinotarsa 10-lineata* Say; (3) *Leptinotarsa flavitarsis* Guer.; (4) *Tauroma casta* Boh.; (5) *Chrysobothris femorata* Oliv.; (6) *Epicauta vittata* Fab.; (7) *Saperda candida* Fab.; (8) *Cicindela scutellaris* Say; (9) *Lema trilineata* Oliv.; (10) *Epilachna borealis* Fab.; (11) *Macrodactylus angustatus* Beauv.; (12) *Cyphus 16-punctata* Linn.; (13) *Popillia japonica* Newman; (14) *Hypomeces squamosus* Fab.; (15) *Omaspides bistriata* Boh.; (16) *Dolichotoma bisbiplagiata* Boh.; (17) *Aspidomorpha miliaris* Fab.; (18) *Doryphora flavozonata* Blanch.; (19) *Doryphora kollari* Stal.; (20) *Doryphora mirabilis* Stal.; (21) *Mesomphalia beatula* Boh. See text under the following Family headings: Tortoise Beetle, Leaf Beetle, Metallic Wood-borer, Meloid Beetle, Long-horned Beetle, Tiger-beetle, Lady-bird Beetle, Scavenger Beetle and Leaf Chafer, and Snout Beetle.



© National Geographic Society 1¼ times Natural Size

BEETLES FROM MANY LANDS DISPLAY THE VERSATILITY OF THEIR ORDER

(1) *Doryphora flavozonata* Blanch.; (2) *Sagra borneoensis* Lac.; (3) *Erotylus giganteus* Linn.; (4) *Carabus auronitens* Fab.; (5) *Julodis viridipes* Cast.; (6) *Ceroglossus gloriosus* Gerst.; (7) *Tegrodera aloga* Skinn.; (8) *Zonabris oculata* Thunbg.; (9) *Dytiscus fasciventris* Say; (10) *Sagra fabricii* Lac.; (11) *Cybister fimbriolatus* Say. See text under the following Family headings: Leaf Beetle, Erotylidae Beetle, Ground-beetle, Metallic Wood-borer, Meloid Beetle, and Predaceous Diving Beetle. The Predaceous Diving Beetles and their kin are the principal foes of the larvae living at the bottom of ponds, creeks, and rivers. The Diving Beetles bear such a close resemblance to some of the diving insects of the Order *Hemiptera* that frequently they are confused with one another.



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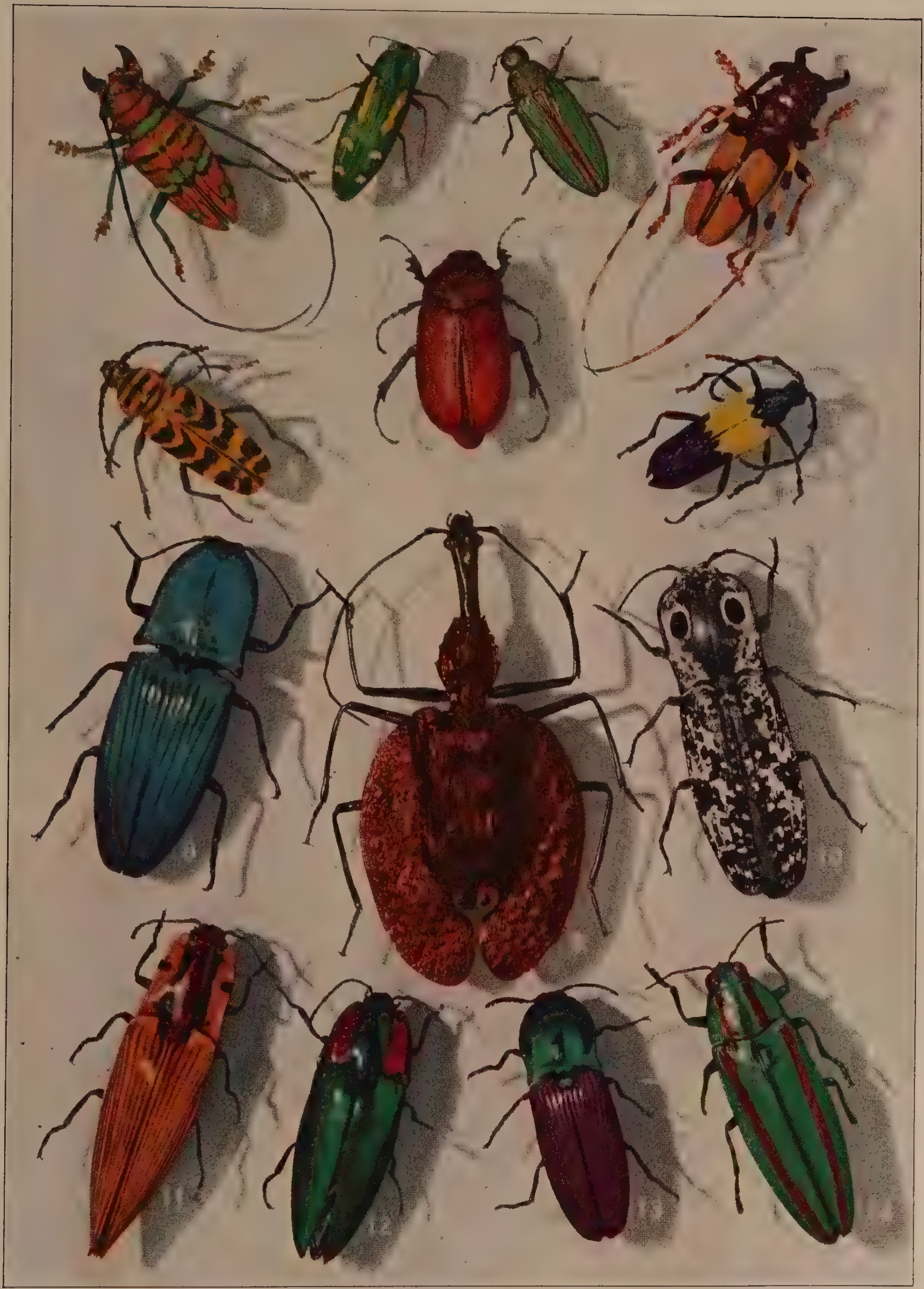
1¼ times Natural Size

A STRIKING GROUP OF WOOD BORING, GROUND-, AND DARKLING BEETLES

(1) *Sternotomis virescens* Westw.; (2) *Crioprosopus magnificus* Le Conte; (3) *Sternotomis mirabilis* Drury; (4) *Calosoma bonariense* Dej.; (5) *Metallonotus metallicus* Fab.; (6) *Hyperantha haemorrhoa* Fairm.; (7) *Psiloptera bicarinata* Thunbg.; (8) *Stigmodera variabilis* Don.; (9) *Calosoma scrutator* Fab.; (10) *Tragidion fulvipenne* Say; (11) *Odontopezus cupreus* Fab. See text under the following Family headings: Long-horned Beetle, Darkling Beetle, and Ground-beetle. Some of the long-horned beetles spend three years in their grub stage and always pupate with their heads toward the exit from their tunnels.



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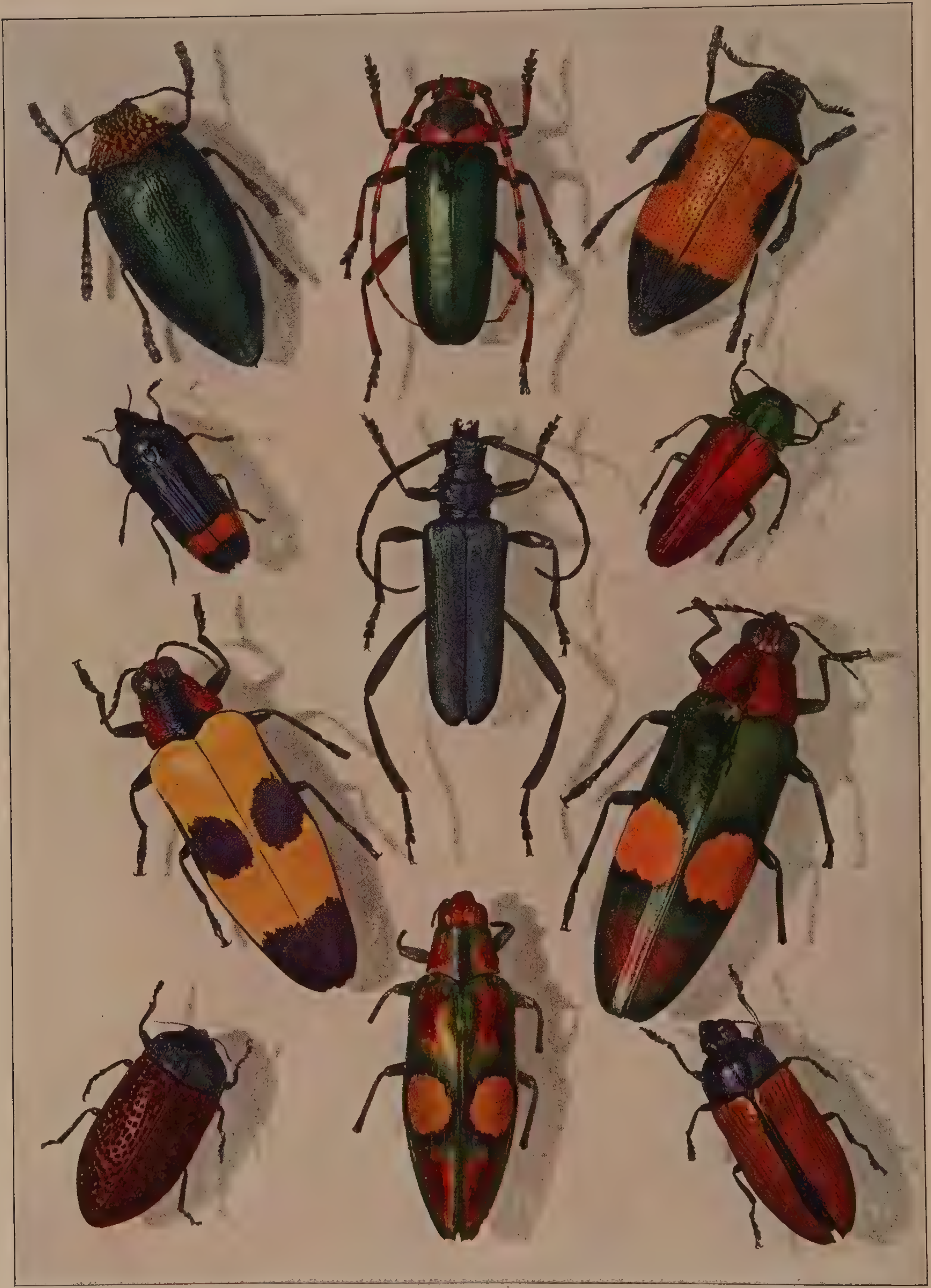
1¼ times Natural Size

SOME OF NATURE'S LITTLE JOKES ATTENDED BY A RESPLENDENT COURT

(1) *Sternotomis bifasciata* Fab.; (2) *Buprestis rufipes* Oliv.; (3) *Buprestis aurulenta* Linn.; (4) *Dendrobias reducta* Casey; (5) *Cyllene decora* Oliv.; (6) *Phyllophaga torta* Lec.; (7) *Desmocerus palliatus* Forst.; (8) *Chalcolepidius lacordairei* Cand.; (9) *Mormolyce hagenbachi* Westw.; (10) *Alaus lusciosus* Hope; (11) *Semiotus imperialis* Guer.; (12) *Campsosternus gemma* Cand.; (13) *Chalcolepidius rubripennis* Lec.; (14) *Chrysochroa fulgidissima* Schoenh. See text under the following Family headings: Long-horned Beetle, Metallic Wood-borer, Scavenger Beetle and Leaf Chafer, Ground-beetle, and Click Beetle.



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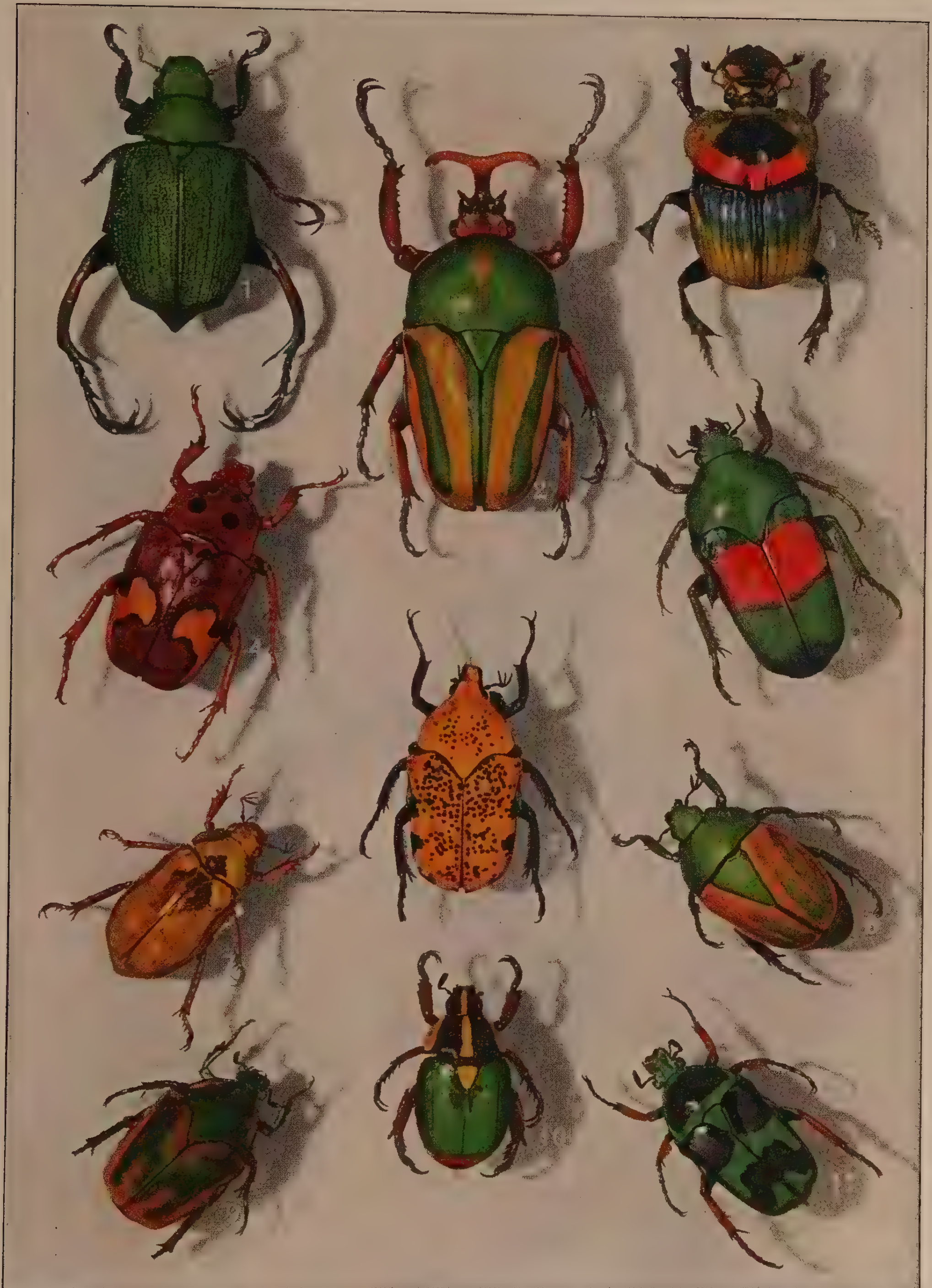
1¼ times Natural Size

FROM WHAT GOLCONDA DO THE BEETLES GET THEIR GEMLIKE GARMENTS?

(1) *Sternocera bennigseni* Kerrem [Male]; (2) *Stenaspis verticalis* Serv. [Female]; (3) *Sternocera hunteri* Waterh. [Male]; (4) *Conognatha amoena* Kirby [Female]; (5) *Callichroma schwarzi* Fisher [Female]; (6) *Belionota sumptuosa* Cast. & Gory [Male]; (7) *Chrysochroa buqueti* Gory [Female]; (8) *Chrysochroa edwardsi* Hope [Male]; (9) *Stigmodera macularia* Donovan [Male]; (10) *Chrysochroa ocellata* Fabricius [Female]; (11) *Stigmodera suturalis* Donovan [Female]. See text under the following Family headings: Metallic Wood-borer and Long-horned Beetle.



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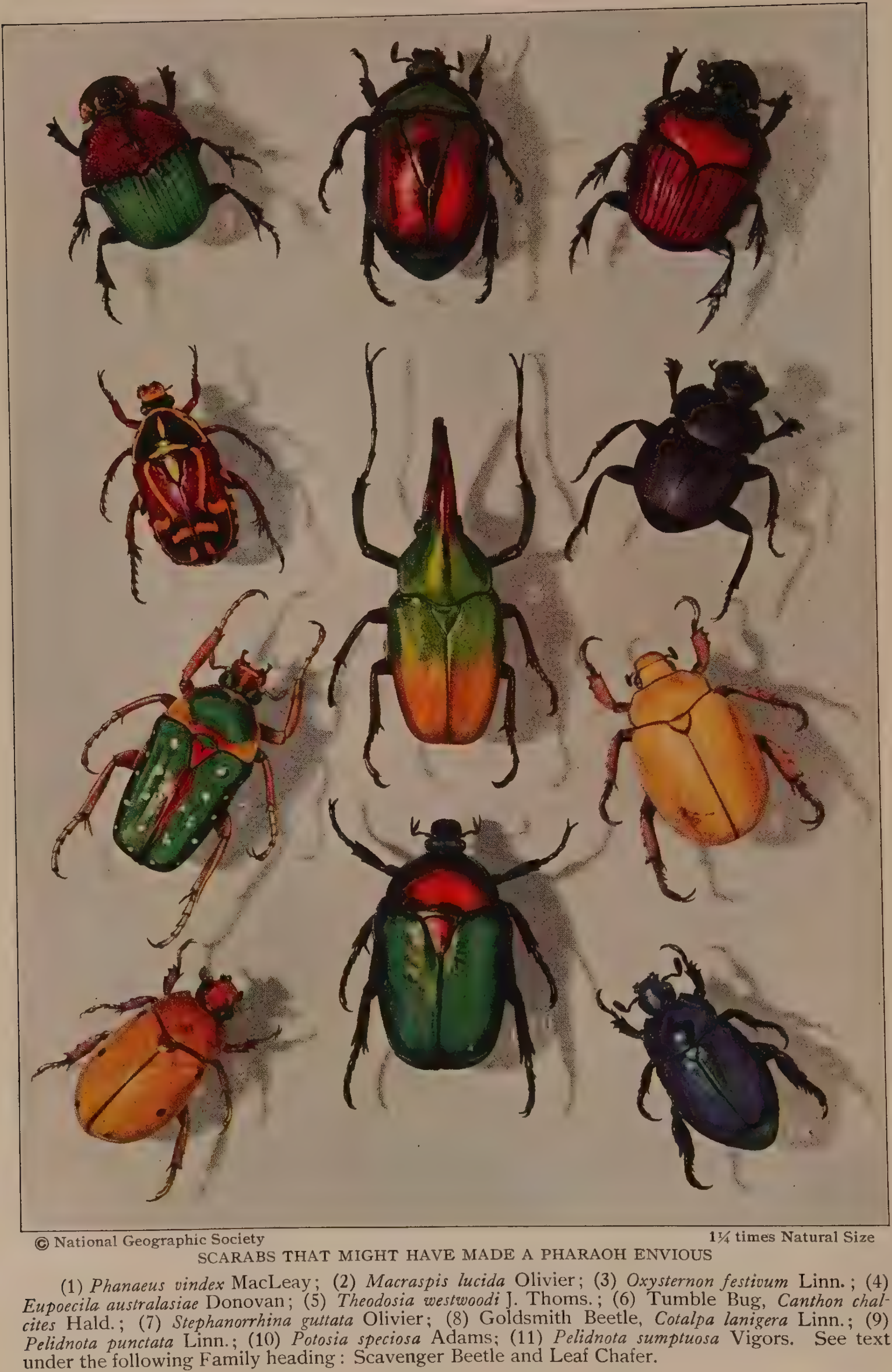
1¼ times Natural Size

DUNG BEETLES IN HABIT, BUT IN ARMOR ROYALLY CLAD

(1) *Chrysophora chrysochlora* Latr. [Male]; (2) *Eudicella morgani* White [Male]; (3) *Phanaeus imperator* Chevr.; (4) *Genyodonta flavomaculata* Fab.; (5) *Argyripa lansbergei* Salle; (6) *Ischiopsopha jamesi* Waterh.; (7) *Plusiotis resplendens* Bouc.; (8) *Macraspis pantochloris* Blanch.; (9) June Bug, *Cotinus nitida* Linn.; (10) *Rutela laeta* Weber; (11) *Heterorrhina macleayi* Kirby. See text under the following Family heading: Scavenger Beetle and Leaf Chafer.



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1¼ times Natural Size

SCARABS THAT MIGHT HAVE MADE A PHARAOH ENVIOUS

(1) *Phanaeus vindex* MacLeay; (2) *Macraspis lucida* Olivier; (3) *Oxysternon festivum* Linn.; (4) *Eupoecila australasiae* Donovan; (5) *Theodosia westwoodi* J. Thoms.; (6) Tumble Bug, *Canthon chalcites* Hald.; (7) *Stephanorrhina guttata* Olivier; (8) Goldsmith Beetle, *Cotalpa lanigera* Linn.; (9) *Pelidnota punctata* Linn.; (10) *Potosia speciosa* Adams; (11) *Pelidnota sumptuosa* Vigors. See text under the following Family heading: Scavenger Beetle and Leaf Chafer.

The round-headed apple-tree borer is perhaps the worst pest among the Cerambycids. In its adult form, it is about three-fourths of an inch long, with two creamy stripes along its brown back from mouth to tail. It deposits its eggs on the bark at the base of the tree it exploits in June and July. These hatch in a few days and the tiny grub works its way into the soft sapwood under the bark.

After its fine chisellike mandibles get the temper of age, it begins to tunnel its way into the heart of the tree, swallowing the borings of the tunnel as it goes. Finally, after three years of eating a path through the wood, it directs its operations toward the surface.

Just before reaching the outer air, and leaving only a tiny membrane ahead of it to be ruptured when it wakes up from its transformation sleep, the grub excavates a nice little chamber, which it carefully lines with smooth, soft materials made from wood fiber, and then lies down for its change-working nap. After two or three weeks of unconsciousness, it awakens no longer a grub, but a fully accoutered long-horn.

The oak pruner has a different method of attack. It lays its egg on a tender twig. When the grub hatches, it enters the twig and feeds on its juicy fiber. As it grows, it relishes a harder diet, so it bores its way into a mature limb, which it finally cuts so thoroughly that when a high wind comes it is blown to the ground. The limb thus acts as a parachute for the grub, allowing it to reach the ground safely. It now uses the severed limb both as a food supply and a habitation. The oak pruner also attacks other trees.

Some species of Cerambycid larvæ remain in wood for surprising periods. After timber is cut and dried and used in the building of houses or the manufacture of furniture, it lacks nutritive qualities, and the growth of the wood-boring grub is so arrested that it often requires many years for the attainment of maturity. I have seen them issue from a porch column that had been standing twenty years, and recently a western college professor reported the issuance of one from the wood of a bookcase that had been in his family for nearly fifty years.

The species reproduced are: *Saperda candida* Fab. (Plate XVIII, figure 7), found in North America; *Sternotomis virescens* Westw. (Plate XX, figure 1), an African species; *Crioprosopus magnificus* LeConte. (Plate XX, figure 2), from Arizona; *Sternotomis mirabilis* Drury. (Plate XX, figure 3), found in the African Gold Coast; *Tragidion fulvipenne* Say. (Plate XX, figure 10), found in central and western United States; *Sternotomis bifasciata* Fab. (Plate XXI, figure 1), found in West Africa; *Dendrobias reducta* Casey. (Plate XXI, figure 4), habitat southern California; *Cyllene decora* Oliv. (Plate XXI, figure 5), habitat southeastern and central United States; *Desmocerus palliatus* Forst. (Plate XXI, figure 7), a native of eastern United States; *Stenaspis verticalis* Serv. (Plate XXII, figure 2), found in Texas, Arizona, and Mexico; *Callichroma schwarzi* Fisher. (Plate XXII, figure 5), found in Texas.

Tiger-beetle Family (*Cicindelidae*). The tiger-beetles are fast runners and quick flyers, and in the larval stage live up to their name, being carnivorous and voracious eaters. In that stage they are uncouth grubs, with big heads and sturdy jaws. They usually dig burrows in the ground, and lie in wait at the entrance for some unfortunate insect that chances to pass that way. In catching their prey the tiger-beetles' larvæ seize the victims with their long, sharp mandibles, and drag them to the bottom of the burrow, where they are eaten at leisure.

The larva is provided with a little hump on the fifth segment of the abdomen, on which are two strong, forward-curving hooks. These it uses to hold itself firmly in position while attacking a victim, lest the latter give a sudden jerk and pull the "bushwhacker" from its hole.

The adult beetles catch their victims and drink the blood after the fashion of a weasel. With their big eyes, long legs, sharp mandibles, and fleet movements, the tiger-beetles are identified easily.

The species reproduced is: *Cicindela scutellaris* Say. (Plate XVIII, figure 8). It ranges between Texas, Arkansas, Nebraska, and Wyoming.

Lady-bird Beetle Family (*Coccinellidae*). Perhaps no beetle clan surpasses the lady-birds as friends of man. Their pretty polka-dot wing cases and their gentle demeanor are in keeping with their beneficent relation to man. But to certain of our insect foes the larvæ of this family are veritable roaring lions and stalking tigers going about seeking whom they may devour. Plant-lice, scale insects, and many others of the "wee beasties" of insectdom the lady-birds destroy by the billions.

The larvæ are more active than beetle grubs usually are, running about on plants in search of game. They ordinarily "change their clothes" three times before reaching maturity, sometimes changing their color in doing so. They spend four or five weeks in the larval stage; the eggs are laid on the bark, stems, and leaves of the trees or plants they visit, and hatch in a few days.

There are about 2,000 known species of lady-birds in the world, of which about 150 species are natives of America. Some have the curious habit of congregating in great masses on mountain tops, to spend the winter, once they have gotten their wings. California fruit growers collect them, and put them in cold storage where they are retained until they are needed for keeping down plant-lice the following summer (see illustration, page 9).

The species reproduced is: *Epilachna borealis* Fab. (Plate XVIII, figure 10), which ranges over North America and Mexico.

Scavenger Beetle and Leaf Chafer Family (*Scarabaeidae*). The Scarabaeid family has two branches, well differentiated by their habits—the scavengers, of which the tumble bug or dung beetle is typical; and the leaf chafers, of which the rose bug or rose chafer is a representative species.

There are about 13,000 known species of Scarabaeids, of which about 5,000 belong to the dung beetle branch of the family.

The ancient Egyptians, observing the beetle's habit of rolling around pills of dung and dirt, are supposed to have interpreted this practice as a typification of the planetary and lunar revolutions, and therefore held that its disappearance and return was emblematic of eternal life (see, also, illustration, page 44).

The leaf chafers constitute the more numerous branch of the Scarabaeid family. In size, the species range from the big June bug or May beetle, down to the small rose chafer or rose bug. The larvæ of the iridescent May beetle are big fat grubs found in lawns, fields, and gardens. They spend three years in their journey from the egg to the possession of wings. In the fall they dig below the frost line, and in the spring come up again to spend the summer feeding on the tiny roots of vegetation.

The rose chafer larvæ seem to thrive best in sandy ground. Observers have noted that in regions where there is a strip of land underlaid with a clay subsoil, bordered by another strip in which there is a sandy subsoil, very few rose chafers appear until the wind blows from the sandy subsoil region. They then come in hosts to the land underlaid with clay.

A newly imported member of the Scarabaeid family is the destructive green Japanese beetle, which a few years ago gained a foothold above Philadelphia on the Jersey side of the Delaware River.

The species reproduced are: *Macrodactylus angustatus* Beauv. (Plate XVIII, figure 11), found in North America; *Popillia japonica* Newman. (Plate XVIII, figure 13), introduced into the United States from Japan; *Phyllophaga torta* Lec. (Plate XXI, figure 6), found in North America; *Chrysophora chrysochlora* Latr. (Plate XXIII, figure 1), found in Ecuador and Peru; *Eudicella morgani* White. (Plate XXIII, figure 2), native of West Africa; *Phanaeus imperator* Chevr. (Plate XXIII, figure 3), habitat South America; *Genyodonta flavomaculata* Fab. (Plate XXIII, figure 4), found in Africa; *Argyripa lansbergei* Salle. (Plate XXIII, figure 5), habitat Brazil; *Ischiopsopha jamesi* Waterh. (Plate XXIII, figure 6), a species from British New Guinea; *Plusiotis resplendens* Bouc. (Plate XXIII, figure 7), a native of Costa Rica; *Macraspis pantochloris* Blanch. (Plate XXIII, figure 8), found in South America; June Bug (*Cotinus nitida* Linn. Plate XXIII, figure 9), a native of eastern and southern United States; *Rutela laeta* Weber. (Plate XXIII, figure 10), found in northern South America; *Heterorrhina macleayi* Kirby. (Plate XXIII, figure 11), a native of Central America; *Phanaeus vindex* MacLeay. (Plate XXIV, figure 1), found in eastern United States; *Macraspis lucida* Olivier. (Plate XXIV, figure 2), found in Central and South America; *Oxysternon festivum* Linn. (Plate XXIV, figure 3), South American species; *Eupoecila australasiae* Donovan. (Plate XXIV, figure 4), native of Australia; *Theodosia westwoodi* J. Thoms. (Plate XXIV, figure 5), habitat Borneo; Tumble Bug (*Canthon chalcites* Hald. Plate XXIV, figure 6), a native of North America; *Stephanorrhina guttata* Olivier.(Plate XXIV, figure 7), found in West Africa; Goldsmith Beetle (*Cotalpa lanigera* Linn. Plate XXIV, figure 8), found in eastern United States; *Pelidnota punctata* Linn. (Plate XXIV, figure 9), familiar species in eastern United States; *Potosia speciosa* Adams. (Plate XXIV, figure 10), habitat southwestern Asia; *Pelidnota sumptuosa* Vigors. (Plate XXIV, figure 11), found in South America.

Snout Beetle Family (*Otiorhynchidae*). This family is represented in our fauna by more than 200 species. It includes Fuller's rose beetle, the strawberry crown girdler, and the black vine weevil. Many of its members are notorious as greenhouse pests.

The species reproduced are: *Cyphus 16-punctata* Linn. (Plate XVIII, figure 12), found in South America; *Hypomeces squamosus* Fab. (Plate XVIII, figure 14), found in India.

Erotylidae Family. This is a small family which resembles click beetles in form, and whose larvæ bore into the stalks of clover. The larvæ of some species feed on fungi.

The species reproduced is: *Erotylus giganteus* Linn. (Plate XIX, figure 3), which occurs in Cayenne, French Guiana.

Carabid Beetle Family (*Carabidae*). The 1,200 species of this group of beetles contain many interesting insects. One of these is the bombardier beetle which, when pursued or attacked by an enemy, fires at the foe a tiny puff of acrid, reddish "smoke," with a popgun report. Comstock has found that the bombardier is able to use four or five rounds of ammunition without exhausting its supply.

One species belonging to the Carabid family is known as *Calosoma scrutator*, the latter part of its name being derived from its habit of scrutinizing everything in its search for caterpillars. It and its close cousins are popularly known as caterpillar hunters. One species has been brought to America from Europe to help wage war on the brown-tail moth. Some of the Calosomas are aggressive foes of the hairy tent-caterpillar that is such an enemy of the orchardist and landscape gardener.

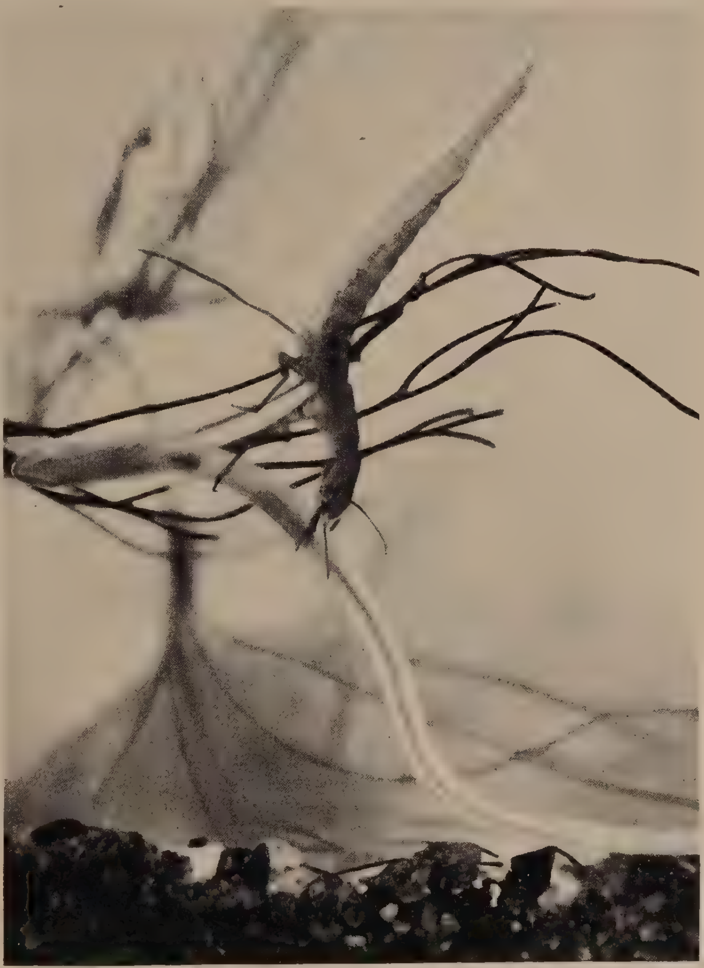
Other Carabids eat the larvæ of codling moths and of the plum curculio. Some species here and elsewhere dwell in caves, and are sightless. Other species dwell in moist, damp places where snails may be found, and have their palpi shaped like long-handled spoons suitable for drawing snails out of their shells.

The species illustrated are: *Carabus auronitens* Fab. (Plate XIX, figure 4), a native of Central Europe; *Ceroglossus gloriosus* Gerst. (Plate XIX, figure 6), found in Chile; *Calosoma bonariense* Dej. (Plate XX, figure 4), found in Brazil and Argentina; *Calosoma scrutator* Fab. (Plate XX, figure 9), a North American species; *Mormolyce hagenbachi* Westw. (Plate XXI, figure 9), a native of Sumatra.

Predaceous Diving Beetle Family (*Dytiscidae*). There are some 300 species of this family of predaceous carnivorous diving beetles in America. They get their name of water-tigers from the persistent manner in which their larvæ search for living food. Research indicates that the adults hibernate in mud, under water. It is believed that the water-tigers were once dry-land dwellers.

Nagel states that the water-tigers secrete a digestive fluid which they inject into the body of their victims, turning the latter's flesh to broth. On this they sup at their pleasure. The mature beetles live for a long time, one entomologist having kept a *Dytiscus* three and a half years in perfect health in a glass vessel filled with water. He fed it bits of raw meat.

The species reproduced are: *Dytiscus fasciventris* Say. (Plate XIX, figure 9), and *Cybister fimbriolatus* Say. (Plate XIX, figure 11), both found in North America.



Photograph by Paul Griswold Howes

A LARVAL WATER-TIGER FEEDING ON A YOUNG EEL

The insect fastened its jaws in the flesh of the eel and swam with great effort to a higher perch in the aquarium. Here it sucked the body juices of the victim until it became white. The water-tigers are among the most ferocious of all the insects.

Darkling Beetle Family (*Tenebrionidae*). These insects occur chiefly in dry and warm regions. Most of the American species, of which there are more than 400, occur in the southern section of the United States. The family includes the *Tenebrio* meal-worm, the forked fungus beetle, and the pinacate bugs. The latter defend themselves when disturbed by elevating the hind part of the body and discharging an oily fluid. After being attacked they walk off clumsily, presenting an absurd appearance with the end of the body held as high as possible.

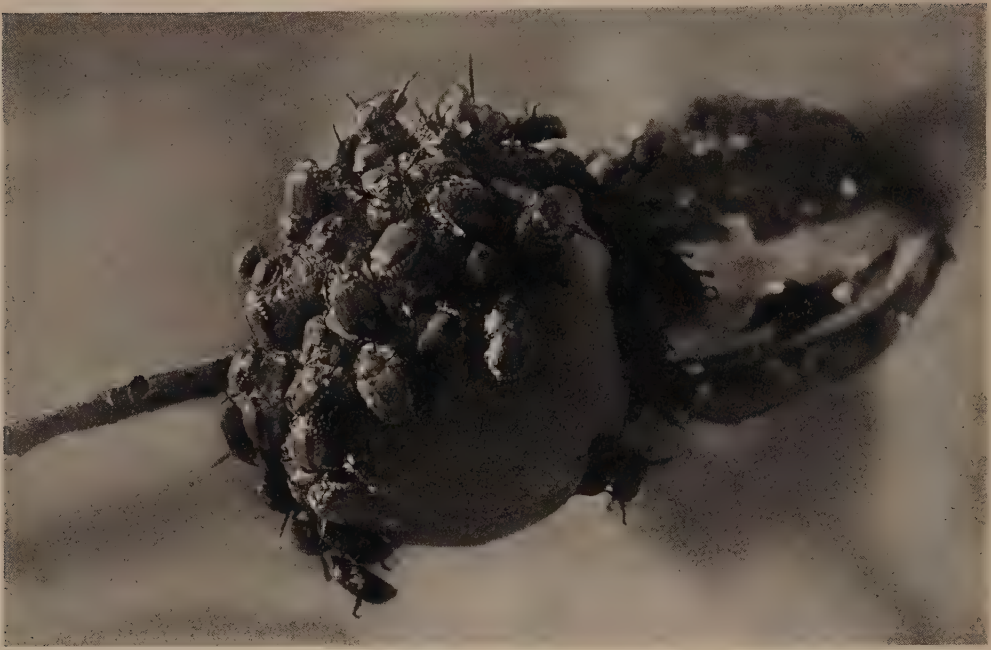
The species reproduced are: *Metallonotus metallicus* Fab. (Plate XX, figure 5), and *Odontopezus cupreus* Fab. (Plate XX, figure 11), found in Africa.

Click Beetle Family (*Elateridae*). The click beetles form a most interesting and cosmopolitan family. There are about 7,000 known species, of which some 350 are found in North America.

The larvæ of the click beetles are the familiar wire-worms which often do so much damage to crops just beginning to grow. Corn, meadow grass, wheat, and other cereals suffer severely from the periodic invasion of the wire-worms. The beetles fly about the fields in the late spring, depositing their eggs in plowed or grassy ground.

In Cuba there are phosphorescent species which emit a strong greenish light. Many women keep them alive in little lace pockets, or fastened to delicate golden chains.

The species reproduced are: *Chalcolepidius lacordairei* Cand. (Plate XXI, figure 8), found in Mexico and Nicaragua; *Alaus lusciosus* Hope. (Plate XXI, figure 10), found in Mexico and southwestern United States; *Semiotus imperialis* Guer. (Plate XXI, figure 11), a native of South America, especially Colombia, Venezuela, and Peru; *Campsosternus gemma* Cand. (Plate XXI, figure 12), a native of China; *Chalcolepidius rubripennis* Lec. (Plate XXI, figure 13), a native of Lower California and Honduras.



JAPANESE BEETLES DINE ON A PEACH

At the beginning of the season the beetles attack the fruits prematurely ripening because of infestation by other foes, but later they turn their attention to the sound peaches, apples, etc. As many as 278 beetles have been removed from a single fruit.

Photographs courtesy U. S. Department of Agriculture

JAPANESE BEETLES COLLECTED BY BOYS AT RIVERTON, NEW JERSEY

In 1916 only a few beetles could be collected by one person in a single day. By 1919 they had become so thick that one person could collect as many as 20,000 in 12 hours. During a recent season an average of one and one-third gallons of beetles were shaken from each of 156 ten-year-old peach trees, all of which seemed as full as ever 24 hours later. An average of 175 larvæ were found in each square yard of a New Jersey pasture.

COLLECTORS OF PARASITIZED JAPANESE BEETLES AT SAPPORO, JAPAN

Scores of women and children of Japan have been enlisted in the work of gathering proved parasites of the Japanese beetle to send to the United States and help us destroy the beetle by this means.

Photographs courtesy U. S. Department of Agriculture

ARMIES OF ALLIES BEING SHIPPED FROM KOIWAI, JAPAN, TO RIVERTON, NEW JERSEY

Nearly 8,000 parasitized grubs of the Japanese beetle are contained in the boxes of this shipment. The parasites belong to the Scoliid wasp family. While man probably will continue to resort to mechanical warfare in holding the Japanese beetle in check, the major offensive is being conducted by insect allies imported from Japan, including three species of the Tachina fly family (see text, page 67), two species of the Dexiid fly family (see text, page 70), four species of the Scoliid wasp family (see text, page 52), and one species of the Carabid beetle family (see text, page 86).

Photograph courtesy U. S. Department of Agriculture

PREPARING TO RAISE AN ARMY OF ALLIES TO FIGHT JAPANESE BEETLES

These workers in the Moorestown, New Jersey, laboratory of the United States Bureau of Entomology are unpacking material just received from Japan. The shipment contains eggs of a little Tachina fly (see text, page 52) which preys on Japanese beetles in the land of the Mikado. It is hoped that the flies from these eggs will slaughter millions of beetles.

The natural-color illustrations of 263 insects in this number of the NATIONAL GEOGRAPHIC MAGAZINE are the result of more than three years of research, selection, and experimentation by the illustrations division of The Magazine.

The specimens pictured represent most of the insect families to be found in North America. They were selected from the U. S. National Museum's collection of more than a million individuals through the generous coöperation of the experts of the Museum and of the Bureau of Entomology of the U. S. Department of Agriculture.

Each specimen reproduced on the 24 full-page color plates was chosen as the most picturesque and colorful representative of its species or family. The subjects selected were placed with care in relaxing jars (a sort of humidor) to render flexible their delicate legs, wings, and antennæ, so that they might be "posed" in lifelike attitudes. After the humidor treatment, the individuals were grouped according to their scientific relation one to another, and each group was then skillfully arranged for symmetry and with appreciation of color contrasts.

The minuteness of some of the specimens, their irreplaceable value in the Museum's collection, and the fragile nature of their many anatomical members added materially to the sense of responsibility of the members of the National Geographic Society's illustrations staff and to the time required in obtaining the desired results.

The 21 color plates of specimens, on each of which is reproduced from 6 to 21 individual insects, were arranged and photographed by Mr. Edwin L. Wisherd, of The Society's photographic staff.

Supplementing the photographic records of the actual specimens are the three paintings showing the life history of three representative insect families—the Caddisfly (Plate I), the Bumble-bee (Plate IX), and the Japanese Beetle (Plate XVII). These have been executed in microscopic detail by The Society's naturalist-artist, Mr. Hashime Murayama.

FRANKLIN L. FISHER.

THE SEALING SAGA OF NEWFOUNDLAND

By Captain Robert A. Bartlett

EIGHT o'clock in the morning, March 7, the port of St. Johns, Newfoundland, is black with men. On that day the sealing fleet sails for the annual hair-seal hunt, the second most valuable fishery of the island. St. Johnsmen line Water Street and crowd out on the piers where the ships lie (see illustration, page 96).

A ROYAL SEND-OFF FOR THE FLEET

Eight ships—four steel, four wooden—two thousand men, the pick of Newfoundland fishermen, steam down the harbor and out past Chain Rock through the notch. The heartfelt wishes of St. Johns and the whole island go with those men and ships.

Whistles scream Godspeed, bells ring out, cannons fire salutes, bunting flies on ship and shore, boys and men race along the Battery Road, cheering the ships to the Narrows and beyond.

Two days previously the vanguard of the fleet, the *Terra Nova*, of Arctic and Antarctic fame and a long sealing record, and the *Thetis*, skippered by William Bartlett, my father, who has been 50 years old for the last quarter of a century—and lives and acts it—sailed from St. Johns for the "back of the island." These two vessels have farther to go, south around Cape Race and west by St. Pierre, to reach the Gulf of St. Lawrence seals, so they go earlier.

Sailing dates are fixed by law and not by weather. No killing is permitted before March 14 nor after May 1.

I have been with the sealing fleet nineteen times and almost as many times on Arctic expeditions with Peary and others. Sealing is a hard life. It is more dangerous than exploring in the Arctic; there's no question about it.

But the excitement of sealing appeals to the right sort of fellow. I have heard men take an oath that they would never, never go again. And they have been the very first ones looking for their berths next spring.

Among the Bartletts seal hunting has been the means of livelihood for more than a century. My great-great-great uncle, Billy Bartlett, was the first man to bring his little shallop beyond the confines of Conception Bay. The story goes—and this is no legend; it is a fact—that with his shallop he went on north to the Funks and found no ice. His crew wondered at him going so far north so early in the year. But he said, "Follow on." And follow on they did. Finally he reached the Labrador coast and found the ice, and on the ice were seals. They soon filled the shallop up and he returned home to Brigus. Forever afterward he was known as "Follow On Bartlett."

So the Bartletts have taken part in the rise of the fishery from the very beginning; from the shallop to the big steel boats. They were following it when it reached its peak in the '50's, when over 400 sailing vessels and 13,000 men prosecuted the seal fishery. Those were the days of big catches; one year the catch reached 700,000 seals. When steam vessels began to displace the sailing fleet, Bartletts were among the first to skipper them.

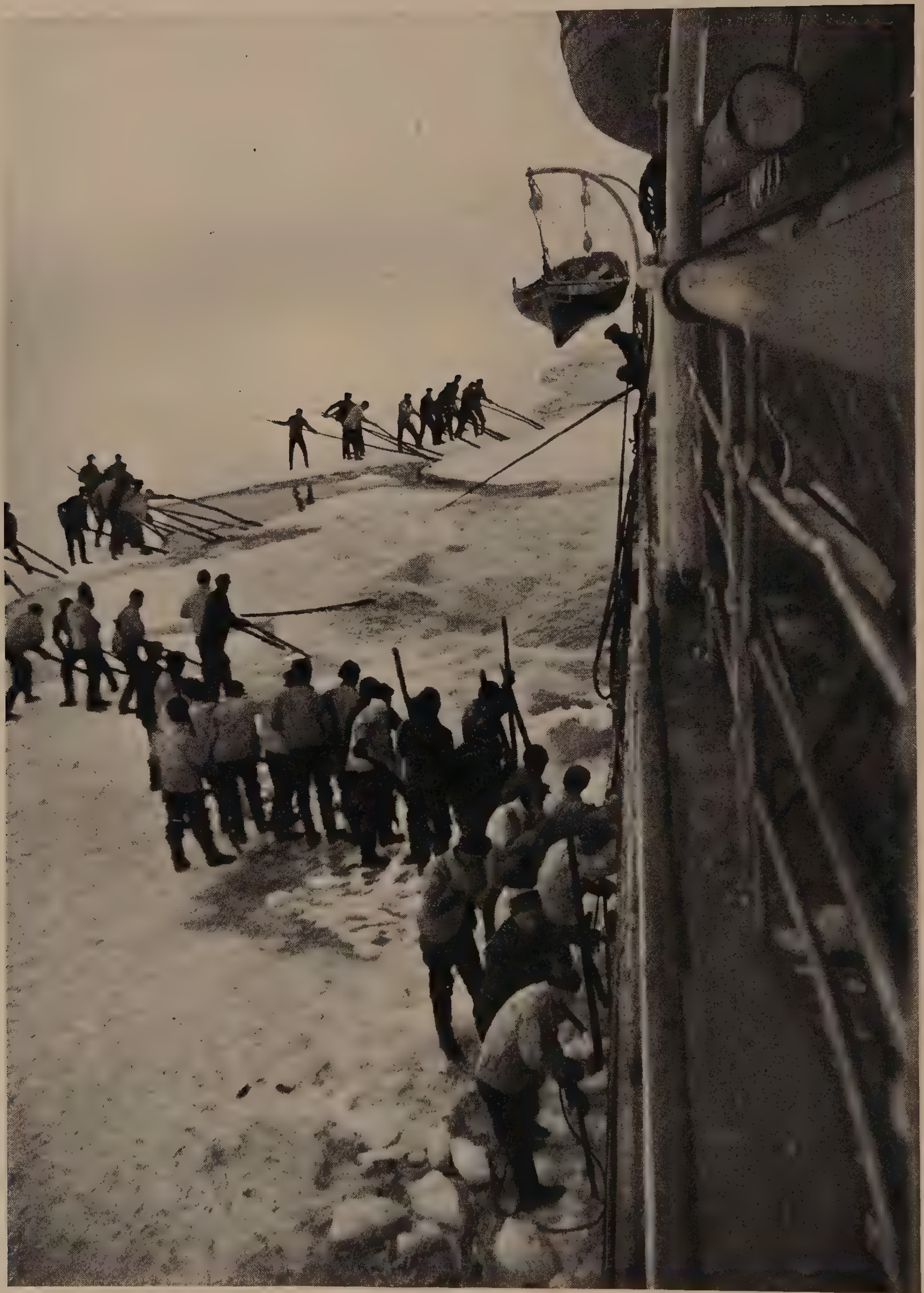
I can just remember the last of the sailing vessels. In my youth, father, Uncle Sam, Uncle Harry, Uncle John, and a cousin, Moses Bartlett, skippered vessels of the sealing fleet. Father is still at it.

Father goes because he likes it. He's just like an old fire horse when it hears the bell. The excitement of it, the lure of it, make him go.

THE START FOR ST. JOHNS

The sealing hands start from the various outports, south and north, late in February, moving on St. Johns, the capital. It is the worst time of the year—rough weather. The men bid good-bye to their families and start out, many on snowshoes, walking to trunk-line railway stations.

St. Johns begins to fill up with them the first days of March. They wear canvas jumpers over homemade guernseys (sweaters), moleskin or homespun trousers, one to four red or white flannel shirts, and home-knit, heavy drawers. Some wear sealskin caps and some elsinors



Photograph by George Harding

A SEALER MUST BE HALF SEAL HIMSELF

The ice is his element. He lives on it during most of the trip. "Get out and push" is no seagoing joke when the skipper's aim is to keep moving. A vessel jammed in the ice, as is the case here, is as helpless as a seaplane on a desert. It cannot get to the seals. Prospects of crew and captain for a profitable voyage grow dim. Rafting ice may crush in the sides or a storm carry both ice and vessel on shore.

SEAL SCOUTING SHIPS TUNING UP AT FOGO, NEWFOUNDLAND

The whole Newfoundland sealing fleet in other years has, on occasions, hunted as long as a month for the "main patch." Finding seals is a matter of minutes for scouting airplanes.

Photographs © Aërial Survey Co., courtesy George Allan England

THE "TERRA NOVA" HITS THE WHITE LINE

To the airplane pilot scouting for seals the vessels look like toys on a birthday cake. All the skill of Newfoundland skippers cannot always save the ships that drive into the grinding ice floes. Of 57 famous sealing steamers, 29 have been lost. One ever-present peril is loss of a propeller by striking broken ice cakes. Vessels are like nuts, the weakest walls are the sides, and for a ship to be nipped amidships by pressing pans is often fatal.

OFF FOR THE SEAL FISHERY WITH BOX AND BAG

February in Newfoundland finds men of the outports making their way over snow-filled trails to the nearest railroad station (see text, page 93).

Photographs by Capt. Robert A. Bartlett

THE MEN WHO CATCH YOUR POCKETBOOKS

A hardy lot are the Newfoundlanders who sail on the annual seal hunt before winter has lifted its ice blanket. The skins they take become pinseal pocketbooks and novelties. Layers of fat on each skin supply oil for the American soap industry. Recently the crews have been ordered to bring in seal livers, from which the important medical product insulin is extracted.

THE AUTHOR AT THE WHEEL OF HIS VESSEL

Capt. "Bob" Bartlett was born at Brigus, Newfoundland, in 1875. At the age of 15 he left school to go on his first sealing trip with his father in the *Panther*. At 19 he passed the examinations for "master of British ships." He was in command of Peary's ship, the *Roosevelt*, in 1908-9, when the great explorer finally reached the North Pole. In 1913-14 he commanded the *Karluk* when it was caught and crushed in the ice 90 miles off Wrangell Island, and led 16 survivors of the disaster safely to land over the ice. He now owns and commands the *Morrissey*, which has been engaged for various Arctic expeditions.

or whalers, which are leather, wool-lined caps with ear flaps. Their mittens are also homemade. Some have tanned sealskin boots soled with leather; others wear three-quarter boots, and others buskins, a low blucher with a wool stocking pulled over.

ONLY THE KEENLY ALERT AND ACTIVE QUALIFY AS HUNTERS

Captains like to sign up men who frequent the open bays fishing and hunting birds and who are seasoned in the woods. A man who has been dragging a sled and lugging wood all winter is in fine fettle for the job ahead of him. He's got good wind to go after the seals. A man snogging seals has to be light-footed, running and jumping over the ice like a deer. A big fellow with broad shoulders has to be followed around with a life belt; he will be falling into the water all the time.

You want men light and nimble, rawboned fellows, small. Sometimes, to get light, we take off everything except our underwear and boots, in order to follow fast after the seals, which can go as fast or faster than a good man running.

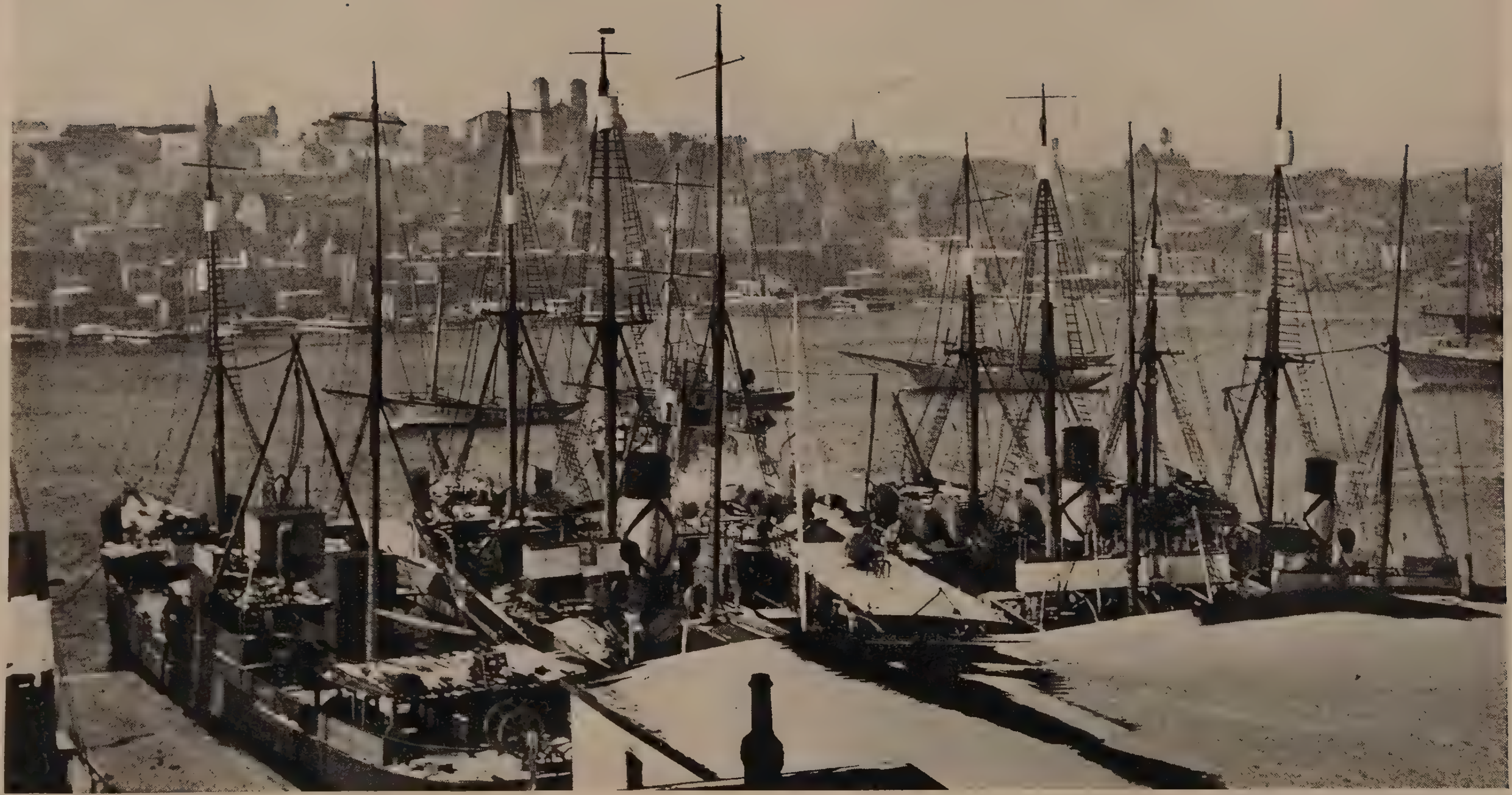
In St. Johns are two concerns that own the vessels and outfit the crews. Between seasons contracts are made with the captains.

A sealing captain is supreme. He can do anything with his ship and his crew, as long as he brings in the seals.

CREWS SIGN ON FOR SHARES

The day is appointed for the signing of the men. "The *Thetis* will sign her crew at 9 o'clock," says a placard on the office of the owners. Men fill up the room and the clerk reads the whereases, the wherefores, the whys, and the shares. Then the sealers put down their names or make their crosses if they can't write.

Each sealer then receives a ticket with his number and name on it, and also a "crop." A crop is an advance of $9; but



Photograph by Ernest Maunder

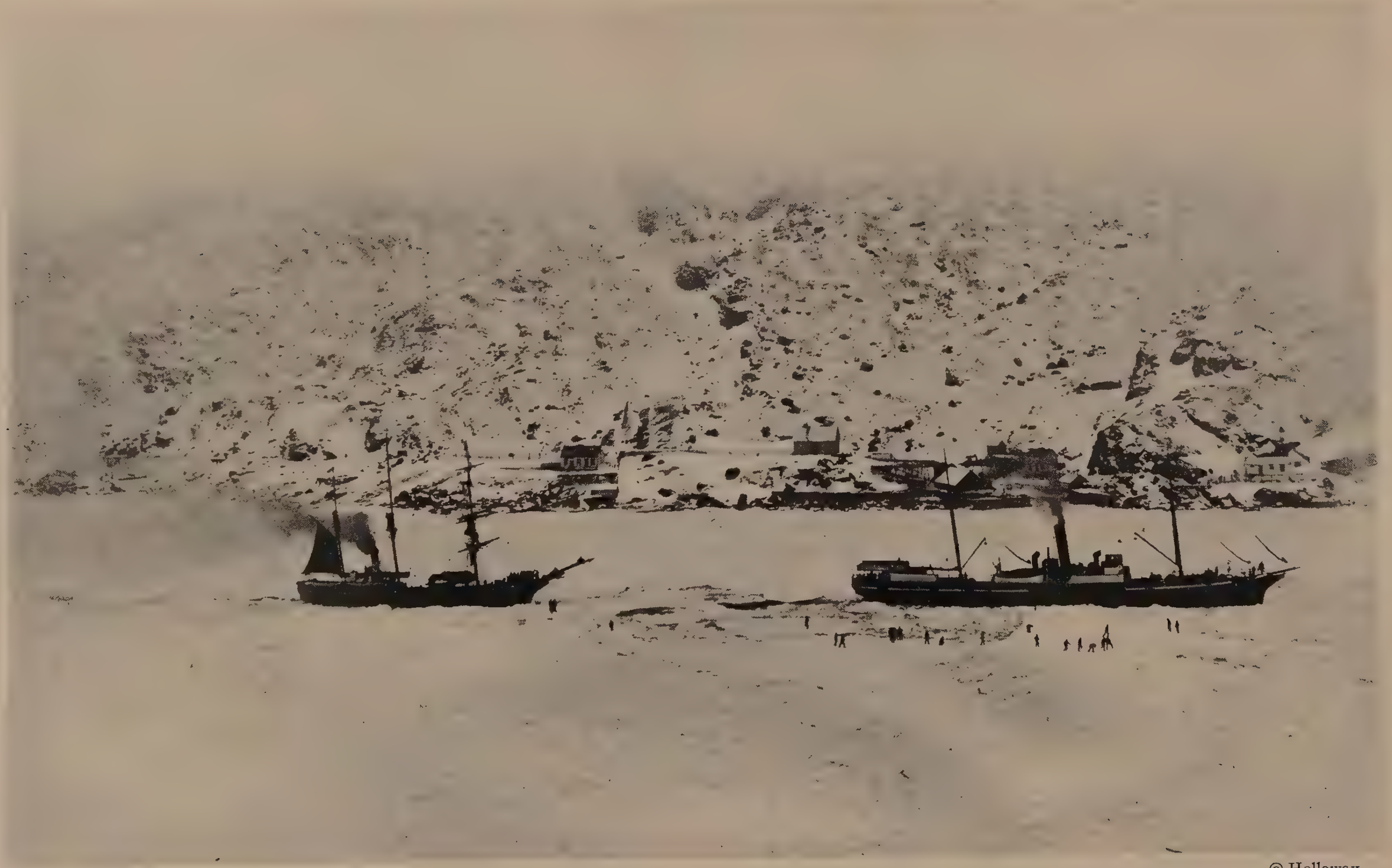
PART OF THE SEALING FLEET IN ST. JOHNS HARBOR AWAITING SAILING DAY

Eight vessels steam out of the harbor on the morning of March 7, amid cheers of citizens crowding the wharves: the *Imogene* and the *Nascopie*, two 2,000-ton steel vessels, each with 280 men hanging over the rails waving caps and shouting good-byes; the *Ranger*, grandmother of the fleet, a wooden sealer sailing on her 57th seal hunt; the *Neptune*, queen of the sealers—she has brought in a million and a half pelts in 56 years; the *Viking*, another old warrior of the ice pans; the *Eagle*, formerly a Norwegian tramp; and the *Beothic* and *Ungava*, two American lakers strengthened to meet the ice. The *Sagona* and *Florencia* this year, for the first time, sailed from Port Union, Newfoundland. The latter vessel, which is new in the seal fishery, was crushed by growlers in the Strait of Belle Isle.

Photograph from Ernest Maunder

THE SEALING FLEET GOES THROUGH THE NARROWS AND INTO THE ICE

"Oh, the day we left St. Johns, my b'ys,
It was a very fine day!
Our wives an' sweethearts on the quay
Says they, ye'll understand;
Farewell, says they, remember me
To the swiles o' Newfoundland!
Our duff was hard, our pork was bad,
We had to drink pinnacle tea!
Hurrah, me b'ys, we'll make a noise,
An' by our gaffs we'll stand!
Me rope upon me shoulder,
Me gaff all in me hand,
Both day an' night 'tis my delight
To kill swiles in Newfoundland!"



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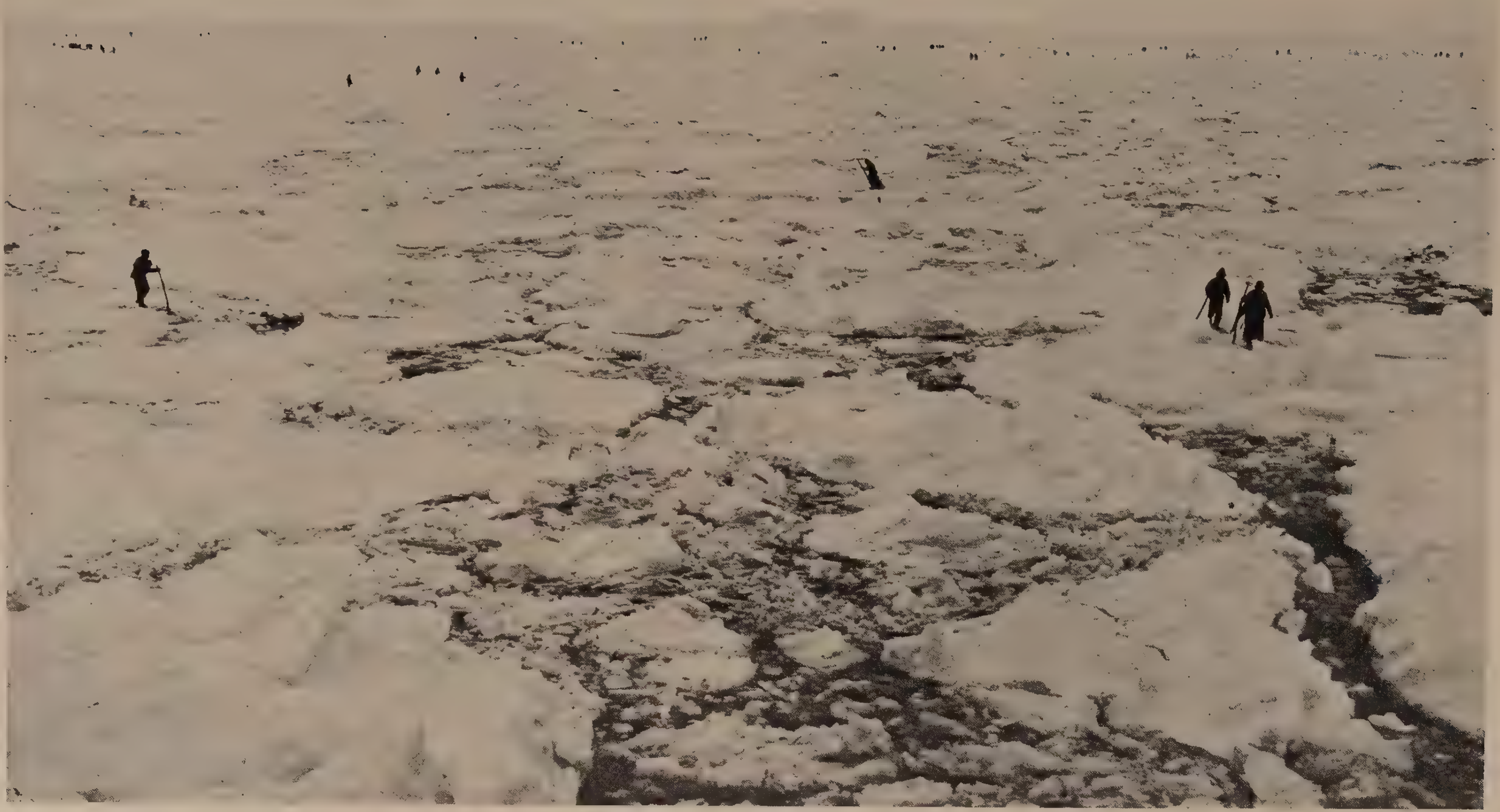
THE "GRAND LAKE" AND THE "KITE" POLING THEIR WAY THROUGH THE ICE OF ST. JOHNS HARBOR

Various are the methods employed to drive a vessel through the ice: dynamiting, rolling (see page 103), cutting ice, and poling. In the last-named method the crew, using long pokers or stabber poles, thrusts the ice broken by the armored prow along the sides and out of reach of the propeller. The *Kite* was the author's first command.



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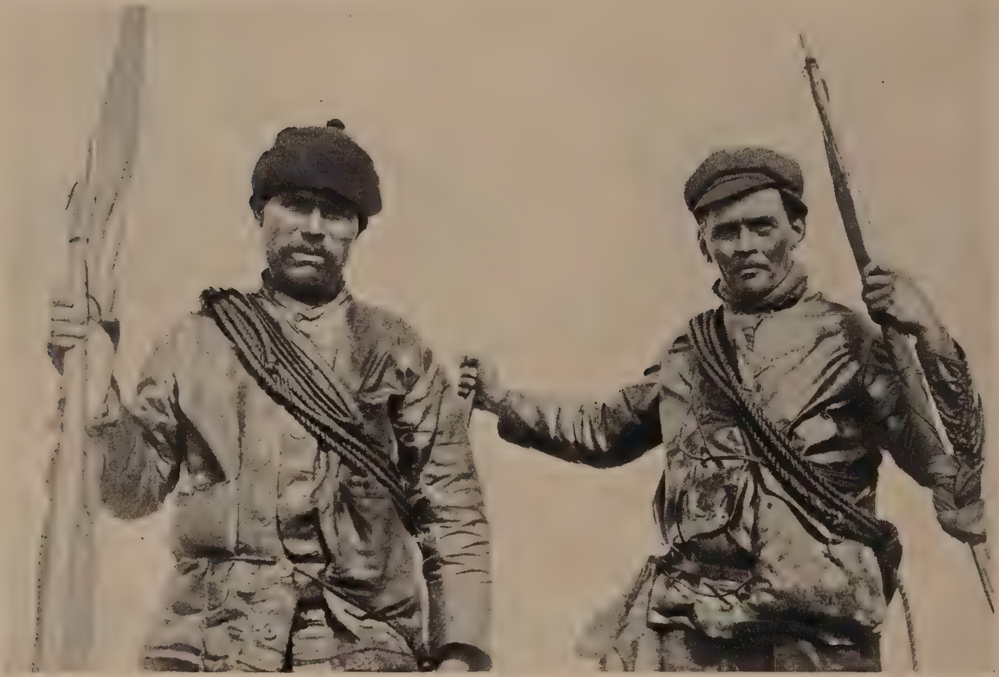
WALKING ON A MAGIC, MOVING CARPET

Sometimes the mosaic of pan ice is quiet. Even in strong gales waves do not form; but after a storm the swell rolls in and a man out after seals finds himself one moment poised on top of an ice hill and the next instant down in a valley whose white walls threaten to crash down on him. From the vessel it looks as if some giant were shaking the carpet, sending ripple after ripple across its limitless expanse. Note the iceberg on the horizon.



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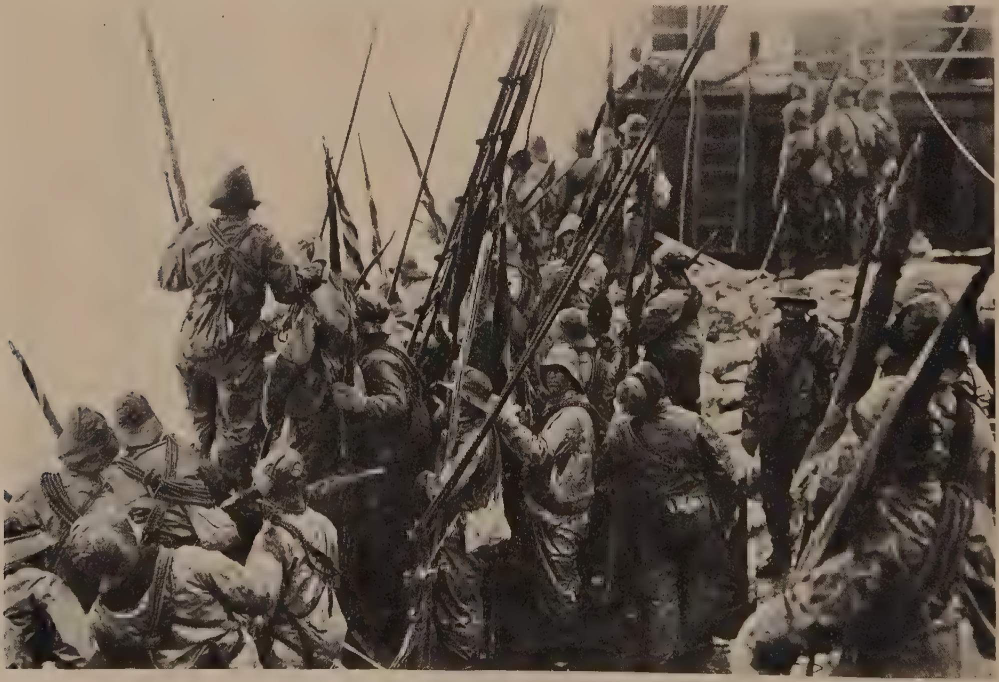
SEALERS IN WORKING "GEAR"

"You want men light and nimble, raw-boned fellows, small. Sometimes, to get light, we take off everything except our underwear and boots" (see page 95).



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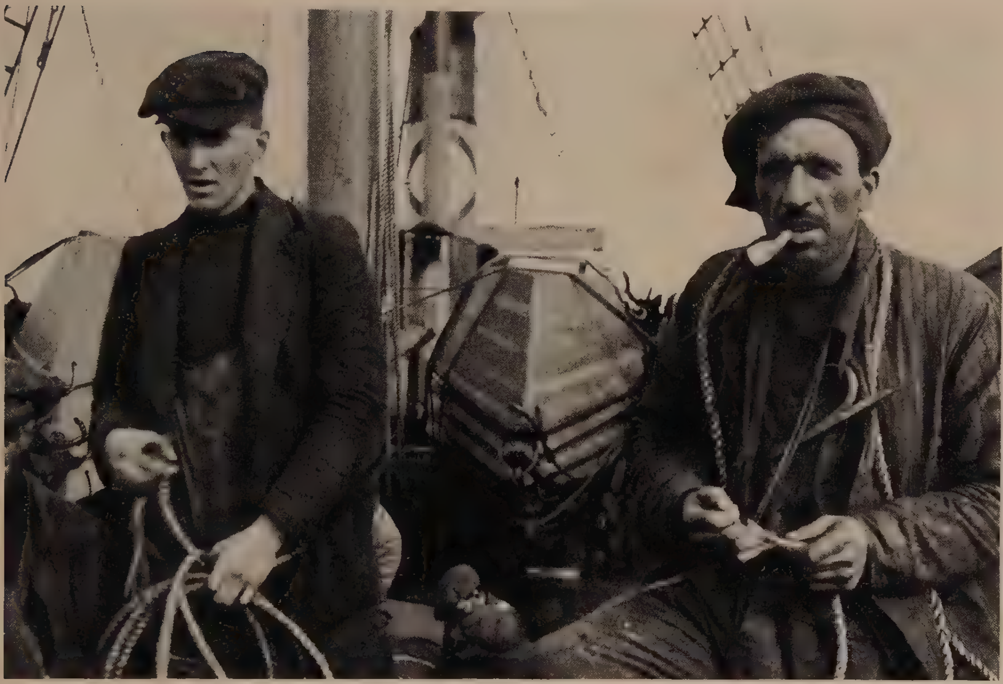
SEALS AHEAD! GET READY ROPES AND GAFFS!

Each sealer goes on the ice well equipped for the work and perils before him: ratline over his shoulder; "nunny" bag, with a lunch of orange, oatmeal, biscuit, and a bit of seal or pork, hung on his back; knife, sheath, and steel in his belt; goggles, compass, watch, and a water canister; and a stout bat in his hand (see text, page 124).



Photograph by Capt. Robert A. Bartlett

WHIPPING AND PUTTING EYES IN "SWILE" (SEAL) ROPES

A sealer prepares his ratline carefully. One end he loops into an eye, the other he trims and binds with spun yarn into a firm point. When he has sculped a seal he threads the point through holes in the pelt, then runs the point through the rope eye, draws the pelt into a bundle, and drags it to the marker (see text, page 124).

a sealer is charged with $12 to repay it, if any seals are brought in. Some men send the whole $9 home; others don't use it; and others buy tea, sugar, belt, sheath and knife, skin boots, oilskins, or tobacco.

If they think they are getting something for nothing, some of the sealers will buy anything—anything from a needle to an anchor.

The best trip I ever made sealing was in the *Bonaventure,* my first steel vessel. The details of it can go for the other sealing trips, too.

I had been lecturing around Chicago when one morning I got a telegram from a sealing concern in St. Johns: "Will you join *Bonaventure* as master, prosecuting gulf seal fishery this spring?" I wired "Yes," and got home the latter part of February.

The *Bonaventure* was a fine, strong, steel vessel of 1,500 tons, built expressly for the seal hunt—extra heavy beams and scantling (fore-and-aft braces), thicker shell plating, a rocker bow, and a heavy stern frame to carry a stout rudder and post.

Two hundred seventy men signed articles. The gulf sailing date fell on Saturday and we were already to cast off at noon. A northeast wind and a blinding snow filled St. Johns Bay with ice, so I decided to anchor in the stream and wait for a clear-up in the weather.

THROUGH FLOATING ICE THE SEALERS PUSH THEIR OBSTINATE WAY

Next morning was Sunday. The Narrows were still filled with drift ice, although the weather had cleared. The distance from our anchorage to the outside of the Narrows was about a half mile, and yet it took us all day to butt our way out. Ice choked the passage. Dark found us at North Head. The night being close, we waited until daylight. Next morning the wind dropped off calm, and with the ebb tide the ice moved seaward. In an hour or two we were in open water.

Then it was easy around Cape Race,

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INTO THE BARREL TO SPY FOR SWILES (SEE TEXT, PAGE 106)

right up to Port aux Basques, which is on the southwest tip of Newfoundland. In times gone by I have traversed this road in old wooden ships, with coal on deck and below, when head winds would make us run for shelter or be washed to pieces.

I had to get my clearance papers from the customs officer at Port aux Basques, but I could not go out before March 12. The other fleet, going down* the "old cow path" on the front of the island, clears from St. Johns. The gulf sealing ships clear from Port aux Basques to be near the sealing grounds.

At 8 o'clock the customs officer gave me clearance and I started out, with the wind blowing from 60 to 70 miles an hour, accompanied by snow. Anchored around and about us were several Gloucester schooners, among which was the *Arethusa,* skippered by Clayton Morrissey, the greatest fish killer out of Gloucester.

Trying to get the *Bonaventure* out of the harbor and clear of the schooners was like trying to get an automobile out of a Fifth Avenue traffic jam. It was a miracle I didn't tear away some of those schooners. We just shaved the main booms as we went out. We had to go.

Blow! How the wind blew!

We cleared Channel Head and we hauled up for Cape Ray. The ice was about 10 miles offshore and the lop (big sea) hove down from the northwest. The *Bonaventure,* with engines wide open, took them green over the forecastle, clean over the bridge. In about 20 minutes she was one solid block of ice.

SHIPS CAN STICK IN ICE, AS WAGONS MIRE IN MUD

With the coming of night the wind dropped, enabling us to make the ice—that is, get under the weather edge of ice, where the water smoothes. Here we lay until daylight next morning. At the first crack of dawn we were under way, following the leads and open water, and at length meeting the big level sheets of slob (new) ice. For a while we made good progress, but, on working in, the leads began to narrow and close up and the sheets got heavier. This slowed us down and at times we were stopped.

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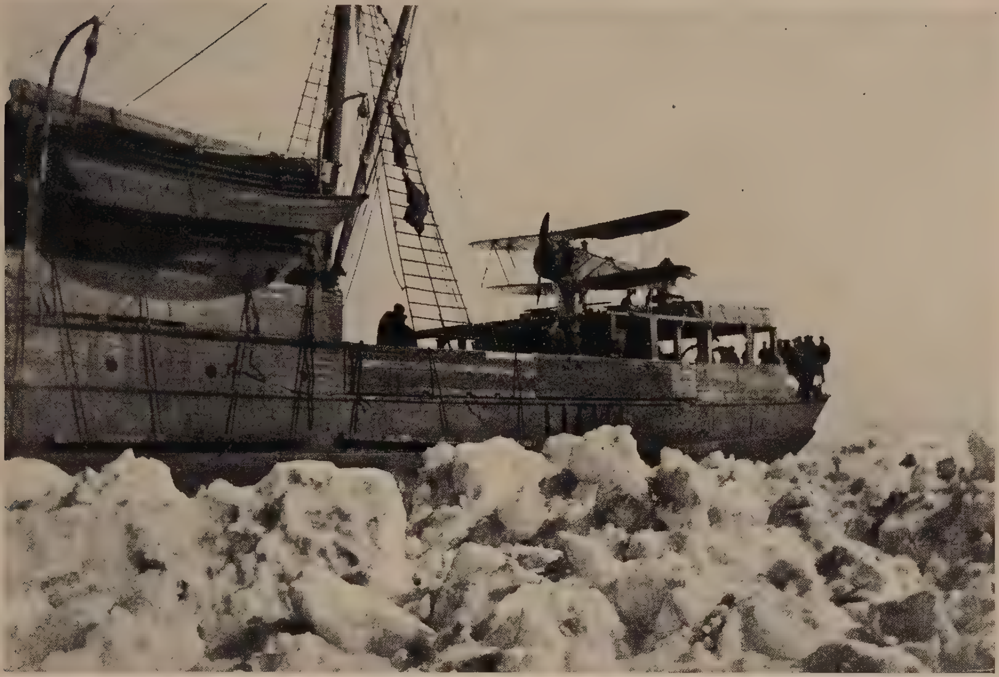
* Newfoundlanders speak of "down north" and "up south."



Photograph from Ernest Maunder

WHAT A BARRELMAN HAS ALWAYS WISHED FOR—WINGS

Airplanes are used in the seal fishery with great success. During the 1929 season the *Terra Nova* and the *Vedas,* out of Cape Breton, Nova Scotia, did not reach the seals until they were guided to them by an airplane. By virtue of this aid they filled up their holds with pelts. The usual practice is to fly the ski-shod planes from land.

As we broke the bars (the points at which the ice sheets impinge), the sheets would swing together, jamming the vessel. She could go neither ahead nor astern. Then we had to resort to all sorts of schemes to get her astern, so we could butt the ice again and break our way through. All hands got on deck and ran from one side to the other to roll the ship.

As long as you can move a ship in slob ice you can break it up and go along. But the *Bonaventure* was too heavy to roll, with all her coal and sealing gear.

So then we put all hands out to free her, breaking up the ice around her sides. We made trenches with axes. This was slow. Dynamite was faster. We planted dynamite on one side and then on the other. Six shots at a time would shake up ice where it was nipping the *Bonaventure* and almost lift her out of the water. The engine, going full speed astern as the charge went off, would haul the vessel out of the trap. Then we would start out again (see, also, page 120).

This went on all day, and by next afternoon we reached the Bird Rock. The night was close and dark, so we lay under the Bird Rock until daylight. When dawn came I worked up under the lee of Brion Island, over toward the east cape of the Magdalens.

The Magdalen Islands are fringed, more or less, by dangerous reefs, which at this season of the year are covered with ice. We call it ballycada—technically, ice foot. The moderate northeast wind moved the ice offshore, so that I could follow along, but on two occasions the vessel scraped the bottom.

That night, at dark, I was well along toward Amherst Island, and we lay in the water between the ice and the land.

Before dawn I went into the barrel (crow's nest, or observation post) and, when light enough to see, I looked out on nothing but close-packed ice in the direction I wanted to go. It was too heavy for us to break our way through. A little later I was delighted to see all around the

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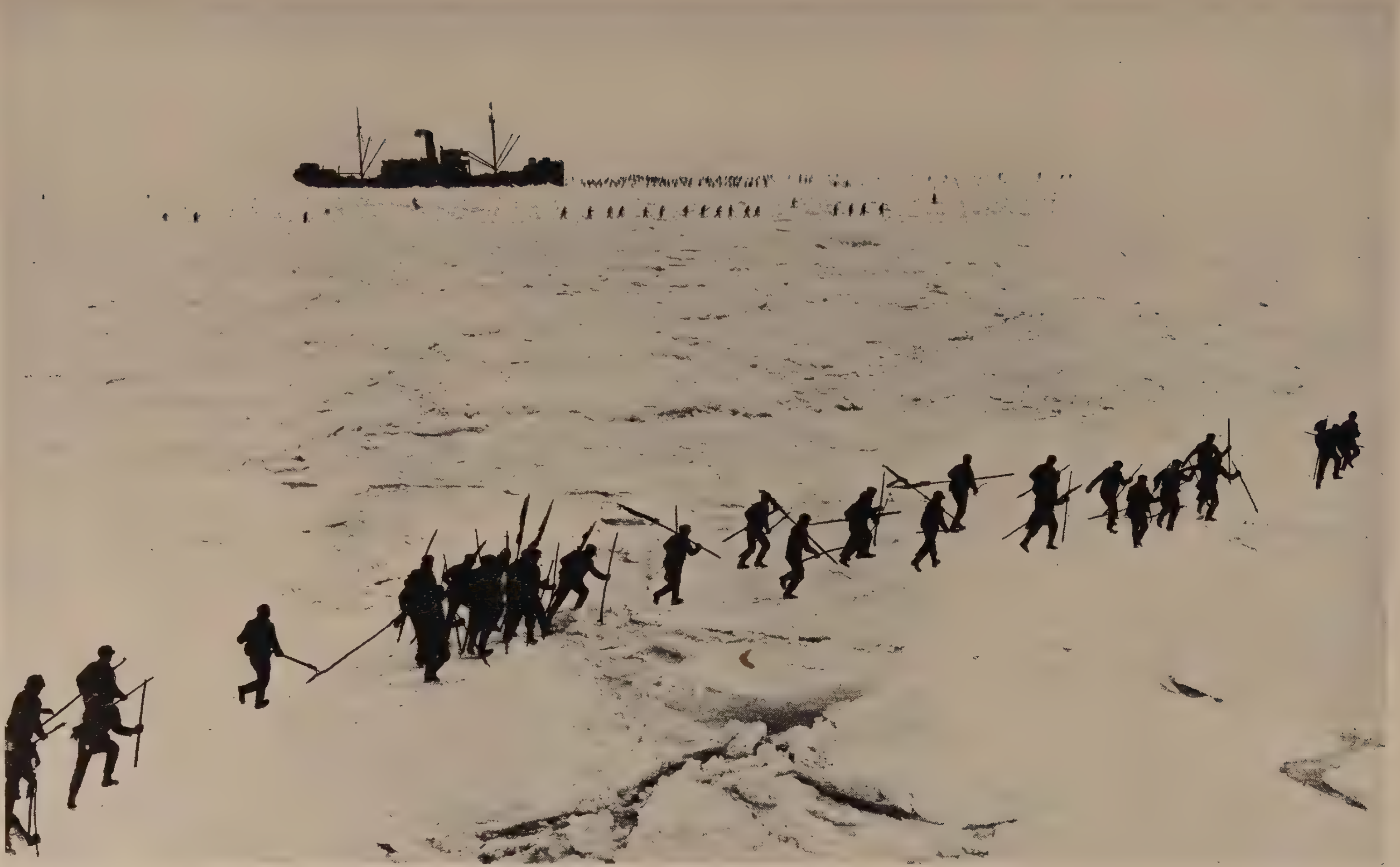
DRIVING THROUGH LOOSE ICE DEMANDS PATIENCE AND CARE

Newfoundlanders have an extensive ice vocabulary: "new ice" or "slob" is thin ice that "makes" in the "leads" and "swatches"—open water—between old "pans" or cakes; "sish" is very thin new ice; "pummy" is soft and ground-up ice; "old ice" is heavy ice that comes down from the St. Lawrence or from Labrador; "growlers" are pieces of icebergs or old floes; "rafted" ice has been tilted up by pressure; an "ice candle" is an icicle.



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ZERO HOUR FOR THE SEAL HUNTERS

Each captain strives to get his men into the patch first, but it seldom happens that he can find and have the "main patch" all to himself. More often several vessels of the sealing fleet reach the seal herd at the same time. Crew competes against crew, man against man. Hundreds of sealers advance over the white no man's land like waves of infantry.

Photograph by George Harding

"ALL ASHORE"

It's not "all aboard," but "all ashore," that brings Newfoundland sealers swarming up the sides of their moving vessel.

vessel schools of old harps, some of them riding the ice near by. Then I knew we were not far from the herd.

About 10 o'clock, as if Aaron had laid his rod on the ice, a vein of water opened just about the width of the vessel and in the direction I wanted to go. For an hour and a half we steamed in this vein of water almost without calling starboard or port.

EXCITEMENT REIGNS WHEN THE SEALS ARE SIGHTED

Sammy Wilcox, the barrelman, yelled down to me to stop the ship, so he could get a good sight through his 6-foot glass. The vibration of the engine interfered. In a second he stopped spying and looked over at me in the second barrel. "Sir," he said, "the whole ice is covered with young and old swiles" (seals).

I yelled out to the cooks, "Are the duffs ready?" When the men heard that, they knew there was something doing. Duff is "plum pudding," served three times a week. The vessel was alive with men running for their ropes, belts, gaffs, sheaths, knives, flags, and oilskins. It was half past 11 o'clock.

I imagine old Johnny Munden, the cook, and George Ackerman, two men grown gray in the sealing service, when they saw the old ones in the water early in the morning, and the speed and direction of the ship, knew that the captain would want the duffs ahead of the usual time. While the men were getting their duffs, I got the vessel into a position for a good evening's work.

Imagine yourself in Central Park surrounded by thousands of sheep and newborn lambs. This is what it looked like. The seals were all together on very large sheets of level ice. This was very unusual for the gulf, and I have never seen the like of it before or since.

"All hands ready!" I shouted. "Ropes and gaffs!"

I put one watch crew on the starboard side, one on the port side, one ahead, and one astern—four watch crews—234 men on the ice. They began killing and panning the seals, knocking them on the heads with a gaff, slitting the carcasses along the belly, removing the sculps or pelts, and hauling them to markers. Markers are colored flags, like golf flags, stuck in the ice at each pile of sculps, so that the captain can return and pick up the pile as the men move on to another patch of the herd.

IN ONE AFTERNOON 8,000 SEALS ARE TAKEN

While the men were at work, the ice allowed me to drive the ship deeper into the herd, so the crew could start from a new base on the next day. We left the first day's catch on the ice. The crews killed some 8,000 seals that afternoon—all young ones, because the "whitecoats," or newborn seals, are the sealer's first choice.

For three full days the kill went on from daylight to dark. All this time the ship was jammed in the ice, preventing us from picking up any seals.

Finally, when the ship couldn't advance any farther, we began to haul sculps over the ice to the vessel. On the fourth day a furious gale sprang up from the west, with blinding snow and freezing weather. Seals and ship drove down on the Cape Breton coast; the ship came within a half mile of shore off Cape St. Lawrence.

The ice, rafting (telescoping) under the force of the gale, threw down our markers. I was up in the barrel and could see them going down one after the other. Our work was being buried under ice. Sculp piles that weren't buried drove out of the gulf out of our reach, while the *Bonaventure* remained jammed in the still ice under land.

Some of our pans wheeled in against the shore ice under Cape St. Lawrence and Cape North, where the landsmen went out with teams and took many skins. Later on, when I got clear, I picked up pans in the mouth of the Bras d'Or Lake, and some in the mouth of Sydney Harbor, and others out around Scatari.

Weeks after, the "bankers," going up for fishing off Cape North, passed through

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NEITHER WILL EVER GO ON THE STAGE

Harp seals do not play heavy leads in vaudeville or circus. Scientific truth requires the blasting of the acrobatic-seal myth. Ball-tossers of the footlights are "flapper" *sea lions* hailing from California beaches. Harbor and fur seals live contentedly in many zoo parks, but neither harp nor hood seals have been maintained in captivity successfully. A few young harps brought to the Bronx Zoo soon died of tuberculosis.

Photograph by Harry Whitney

LOADING "PINNACLE TEA"

When need for a supply of fresh water arises, the captain sends men overboard to cut pinnacle ice (see page 123). As sea water freezes, the first ice formed contains little or no salt. In this way stronger and stronger brine is concentrated in pockets and freezes only when the temperature becomes very low. These salt pockets are first to melt when the temperature rises. They drain out wherever openings permit, as in ice uplifted in thin sheets or fragments. Thus pinnacle ice, though still frozen, may be practically free from salt.

many hundreds of floating pelts from shattered floes. Our pans were scattered over the whole ocean!

By labor and search we salvaged 26,000 pelts—only about half the seals killed—but it was the biggest catch ever brought out of the Gulf of St. Lawrence until my father last year brought out 30,800 sculps.

NOT ALL SEALS ARE SLAIN FOR FUR ALONE

Where do these seals come from?

What kind of seals are they?

I went to the Pribilof Islands, in Bering Sea, last year. The Pribilof seals are different from the harps and hoods that we hunt off Newfoundland. The Pribilof is a fur seal (near relative of the sea lions) and its skin is used for making beautiful coats, worn by fair ladies to give them an air of distinction. It hauls out on the land. It pups or whelps on the land, while the harp and the hood haul out on the ice to give birth to their puppies. We call it seal "fishery" in Newfoundland, because the Atlantic seals live as much in the water as cod and haddock. During the season of Lent the sealers eat the hair seals just as they would fish.

When I tell girls about the large number of seals we get off Newfoundland, some of them say, "Why don't you bring me a coat?" I feel like thirty cents, knowing I can't comply with their wishes. Well, I am sorry, I tell them, but the seals we go after are the hair seals, and all they are good for is to make soap and pocketbooks.

There are several different kinds of seals around the shores of Newfoundland and the Gulf of St. Lawrence: the square flipper, the horsehead or gray seal, the jar or ringed seal, the bay or shore seal, the harp seal (*Phoca grœnlandica*), and the hooded seal (*Cystophora cristata*). The harp and the hood are the two kinds that we hunt in our sealing vessels. The first four varieties mentioned hang about Newfoundland and other northern waters, in

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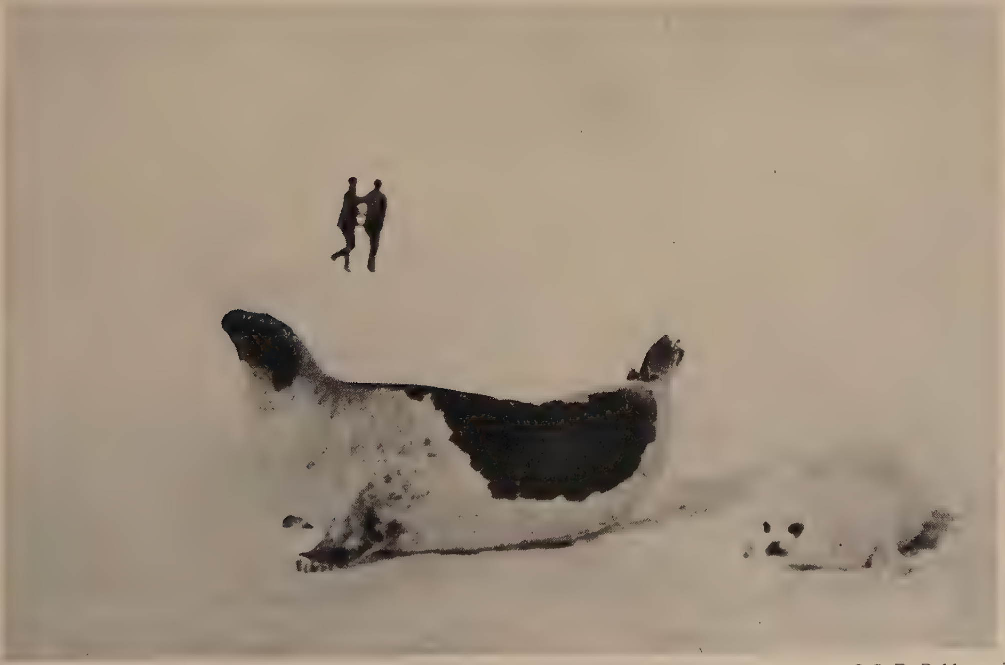
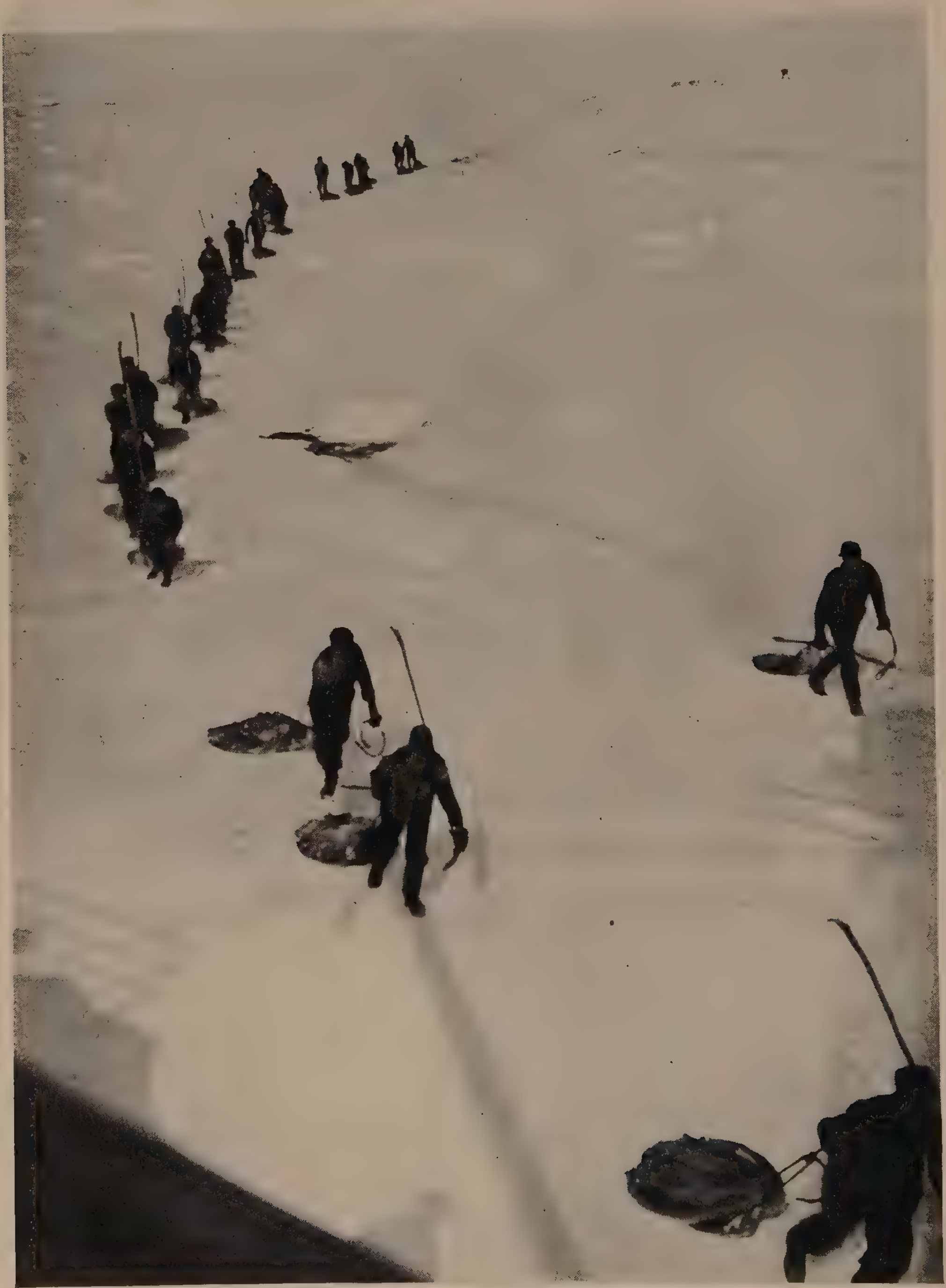
"THE BABY HARP LOOKS LIKE A FLUFFY WHITE MUFF WITH TWO LARGE, LIQUID BROWN EYES PEERING OUT"



© S. R. Oakley

HOW THE HARP SEAL GETS ITS NAME

The shape of the patch on the back of members of this species is supposed to resemble the outline of a harp. Scientific knowledge of the migrant seals is still incomplete. Whether young "whitecoats" suckle or whether they lap up their mother's rich milk from the ice is a moot question. The harp is also known as a saddle-back or Greenland seal.



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THE GREATEST SEAL HUNT IN THE NEW WORLD

Seals inhabit all the oceans and are taken by hunters on many shores. The protected fur-seal rookery of the Pribilof Islands is expected to yield 33,000 pelts this year. Newfoundland's annual seal fishery nets about 200,000 pelts. Possibly the Norwegians and Russians together take more seals over a broad area from Greenland to Novaya Zemlya, but accurate figures are lacking. The islanders nurse the hope that a process can be discovered to make the fluffy fur of a whitecoat hold fast to the skin. Such a development would put Newfoundland on a par with Alaska as a seal-fur producer. Only the soft coat of a "cat," a stillborn Newfoundland seal, is tight enough to warrant the skin's use as apparel.

© Holloway

WHEN A SKIPPER'S WORRIES BEGIN

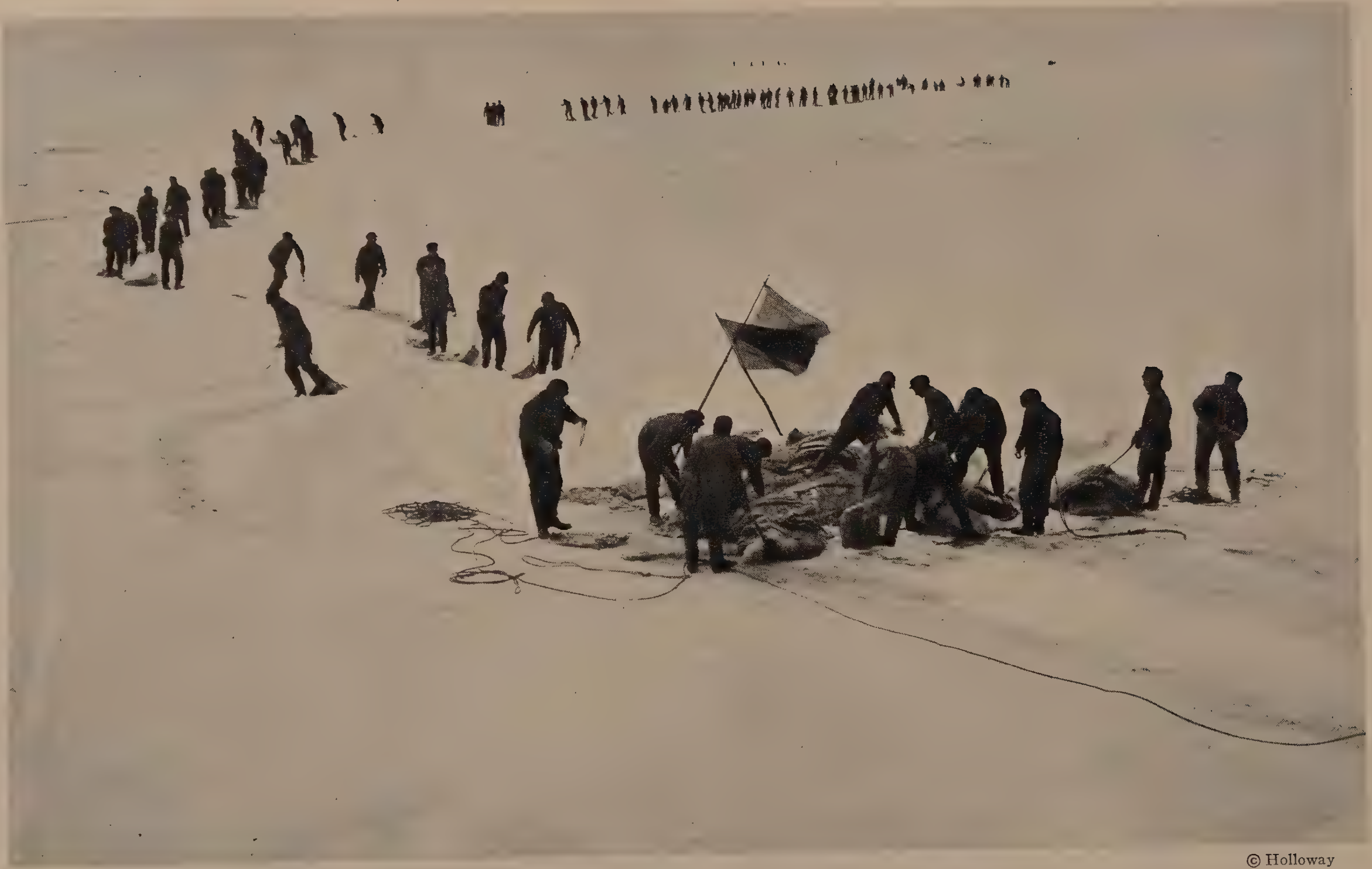
No captain is at ease when his crew goes on the ice. Stormy March bears many an ill wind imperiling sealers. Men have been lost on the ice in blizzards and fogs, but weather reports by wireless from Toronto and Washington have reduced the dangers and casualties of the seal fishery.

small groups, but only the hood and the harp herds beat away to the northward and return to their whelping grounds in an annual migration over 2,000 miles of ocean.

ESKIMOS TRAP SEALS IN NETS AS BIG HERDS MOVE IN SEASONAL MIGRATIONS

While on Arctic expeditions in recent summers I have frequented Jones Sound and the north water of the whalers, and there I have seen large schools of harps. In talking with the Eskimos and the white residents of Baffin Island, Hudson Strait, and Labrador, they told me of the migration—how in the spring they catch the seals in nets and weirs, as the herds work north along the Labrador coast and across the Hudson Strait and its northern shore, on north along the harbors and inlets of Baffin Island and Ellesmere Island; and again, in October, when the herds return, the Eskimos and livyeres (whites who live permanently on the Labrador coast) set their nets.

The hoods come south, along the west side of Greenland, a little later than the harps come along the Labrador coast. When the former reach the end of Greenland they go across about 500 miles of open sea to the Labrador coast. The harps come on down, and in the month of January they are off Battle Harbor. They continue southward to the Grand Banks, where they fill up with cod, herring, and capelin. They get well fattened, so their newborn pups may have rich milk, showing how wise are the workings of Nature.



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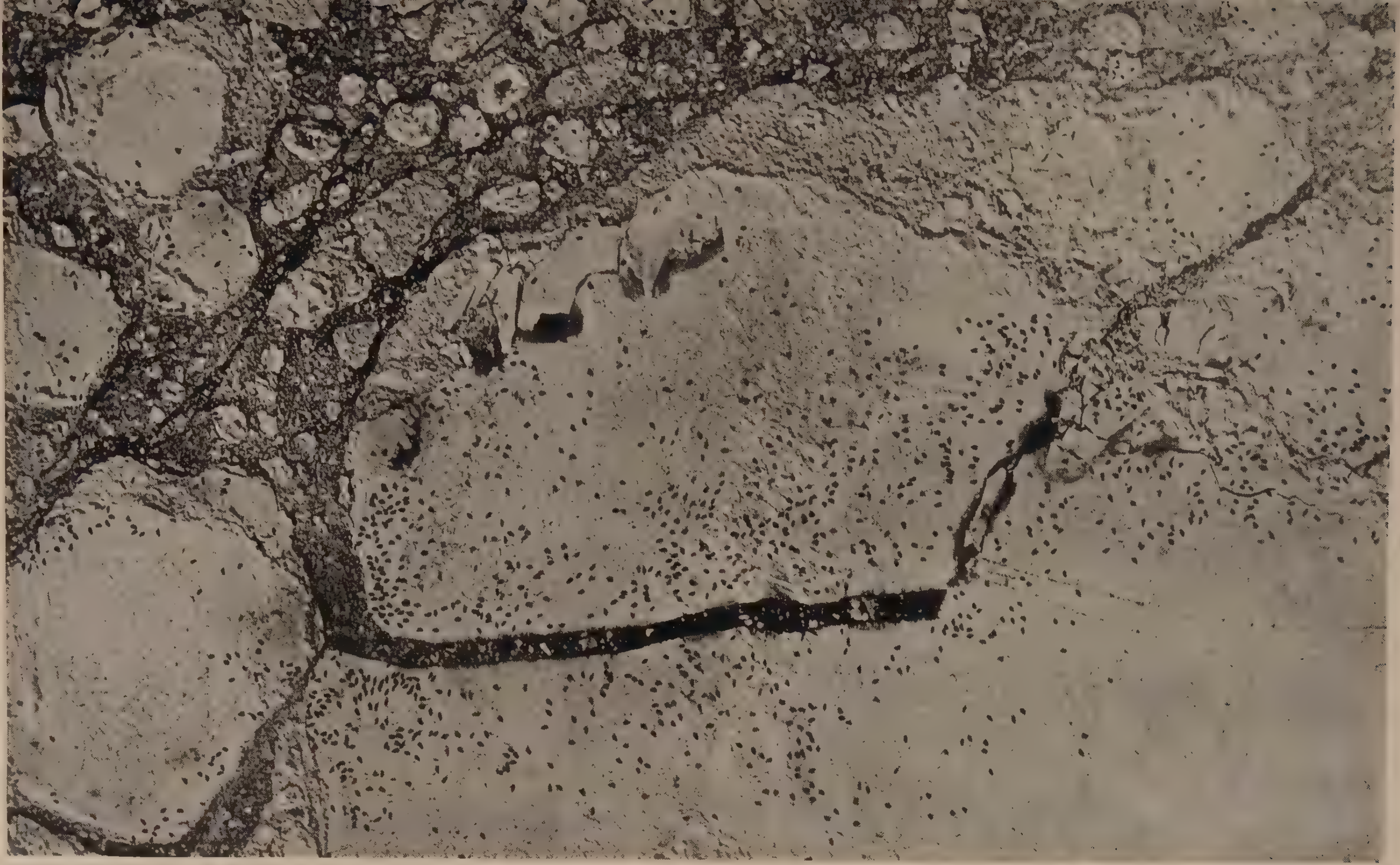
HAULING SCULPS TO A MARKER

A sealer can drag three to six pelts to a marker at one time. A "gert feller" can skin a seal in a minute; some have done it in 40 seconds. Any sealer who can kill, skin, and pan 120 in a day is a good hand. Men have been known to do 300 in a day (see text, page 125).



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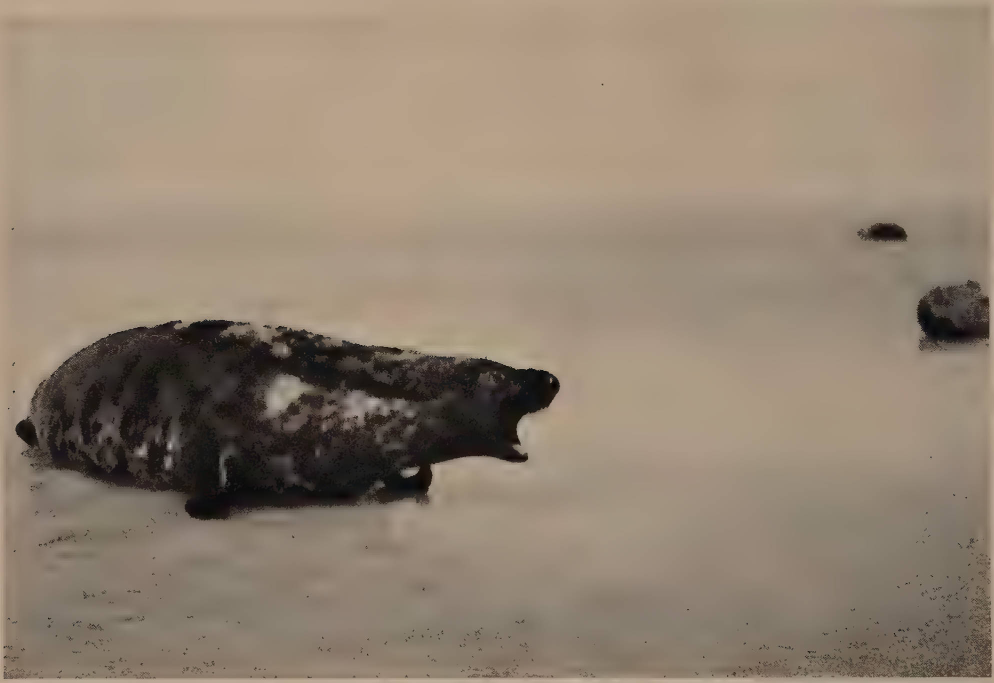
NOT ANTS ON A GARDEN FLAGSTONE, BUT SEALS ON ARCTIC ICE

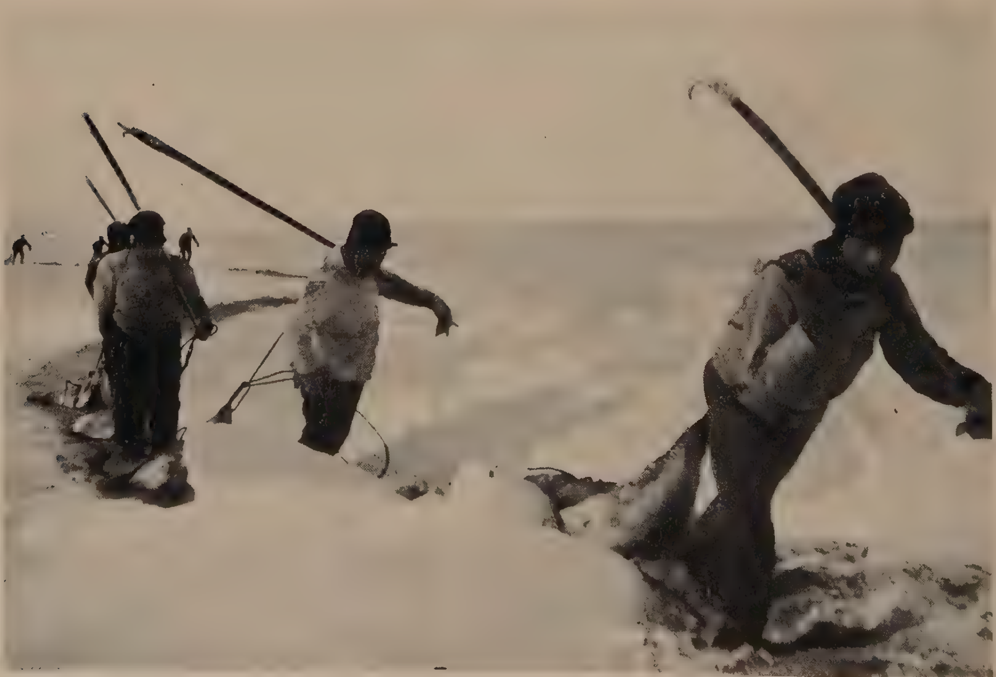
These seals, spotted by a Russian seal scout plane somewhere off the entrance to the White Sea, gather in herds at the breeding season. Still another seal herd is known to migrate in the ice-filled waters between the east coast of Greenland and Jan Mayen Island and Iceland. Norwegians as well as Russians take part in the seal hunts in waters north of Europe.



Photograph by Harry Whitney

A HOOD SEAL SHOWS FIGHT

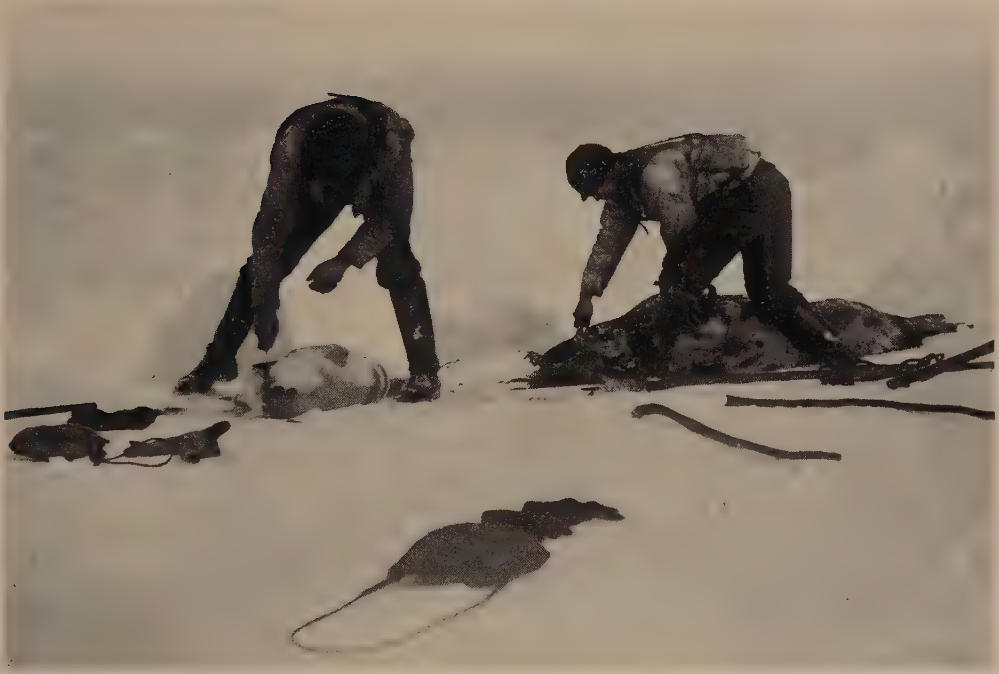
Both male and female hoods will defend the young pup. Mother hoods sometimes take their young in their flippers and escape to safety, or will nose their pups into the water, but the foolish young seals often climb back on the ice and are taken by the hunter (see page 116).



Photograph by George Harding

MAN DRAWS A RED MARK ON THE WHITE NORTH

Sealers hauling sculps to a marker leave crimson paths on the glistening white ice floes. Some Newfoundlanders contend that the seal herds, if not depleted by the annual hunt, would multiply to such an extent that they would ruin Newfoundland's fishery resources (page 119).



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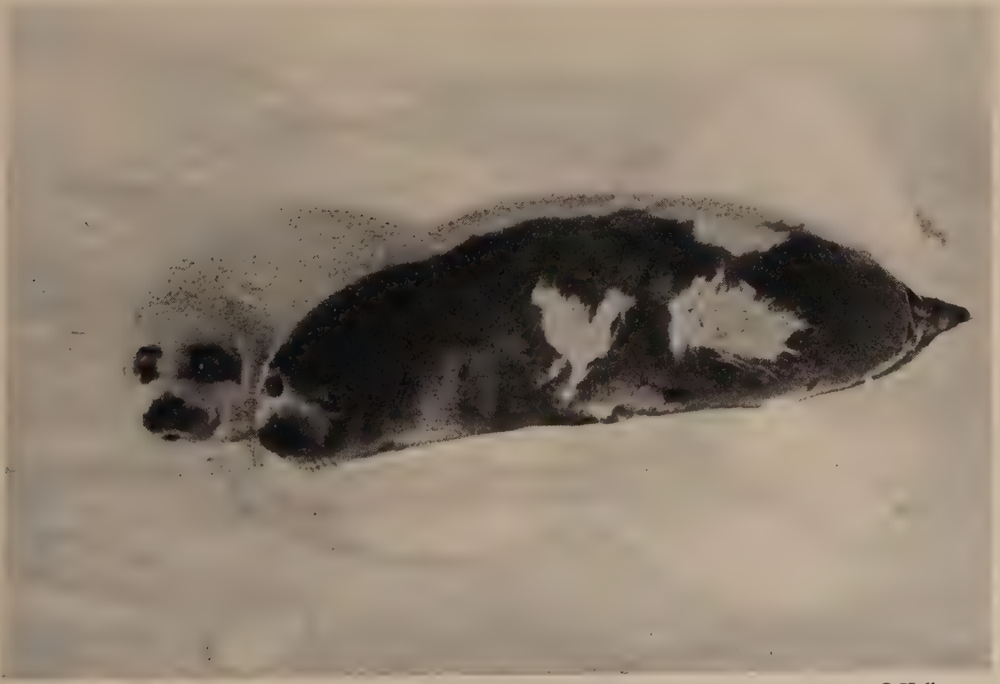
SCULPING A MOTHER AND PUP

A sealer will shuck a seal from its coat almost as neatly and easily as one peals a banana. Hunters especially prize seal hearts and flippers for supper when the hard day on the ice is done (see, also, text, page 123).



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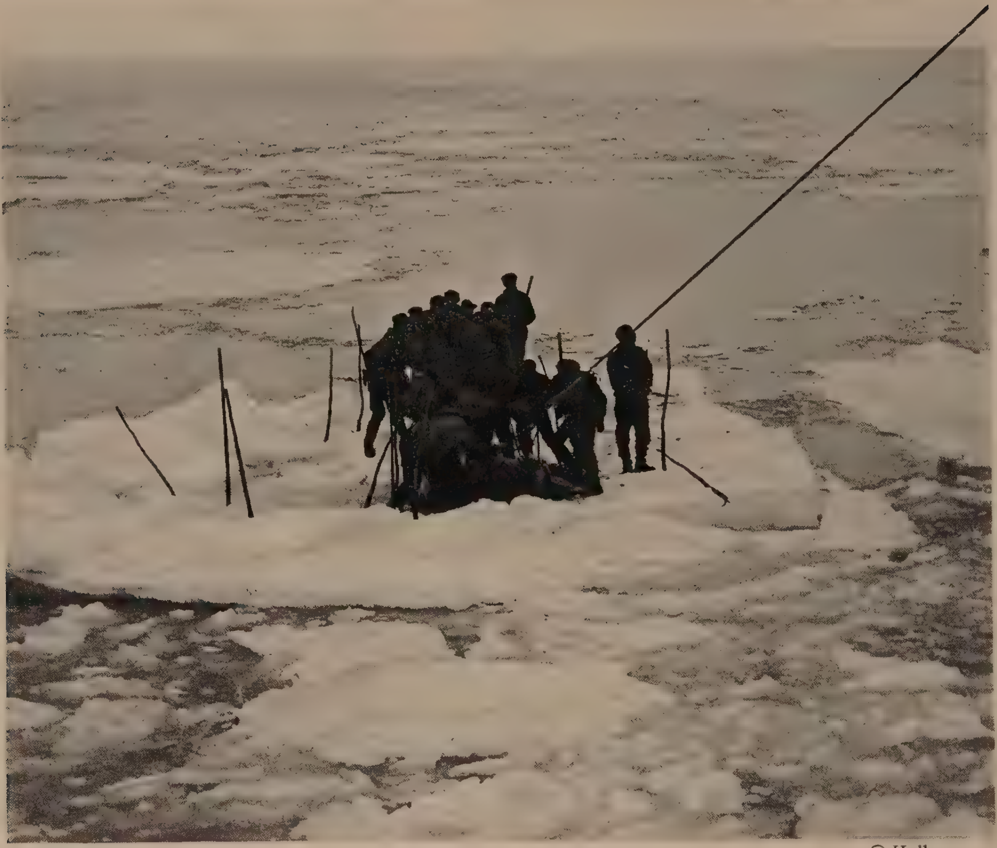
SEALERS PREFER BLONDES

The whitecoat harp is the darling of the seal hunter. He is easy to catch and sculp. The layer of fat under his gosling fuzz coat yields the best oil. When he becomes a brunette "ragged jacket" he is ready to roll in the water and swim north with the herd.



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HOISTING SEAL PELTS ABOARD

The master of each watch on the ice sets up markers (poles flying numbered flags), to which the men drag the seal pelts. A watch may collect 50 to 100 sculps at each marker. The sealing vessel steams through the ice, picking up the pelts as she comes alongside.

The hoods never mix with the harps, but they parallel them in their drift south. They whelp to the eastward of the harps several days later.

The hood is a larger seal than the harp. Its skin is spotted like a leopard's. The mother always stays with her young and will fight to the death to save it. The harp mother will run away. One has to kill the dog hood, too, in order to get the young; for when the dog comes toward the sealer he has to run unless he has a gun. I've seen dog hoods chase a skinner and carry a half-sculped young seal into the water (see page 114).

THE HOOD SEAL HAS A RUBBERLIKE HEAD COVERING

The hood's method of mounting the ice is different from a harp's during whelping season. It comes up over the edge of the ice, while the harp seal bores its way up through the ice.

The hood always whelps in families—dog, bitch, and pup. The dog hood is larger than the dog harp, is more loyal to his wife, and will help her in her wifely duties. He will hang around and help defend the family, while early in the whelping season the dog harp goes off on a vacation. The dog hood's head is protected by a loose, rubberlike cap, or "hood," from which he gets his name. When he is angry he inflates his hood, which is like a monk's cowl and protects his brain. Really, there are two caps—an outer black cap and an inner red cap. An experienced seal hunter with a stick can put him out of business, but the best way to kill the male hood is to shoot him.

Photograph from Holloway

THE "TERRA NOVA," STILL GOING STRONG

The seal fishery of Newfoundland has been a training field for crews and vessels to which Arctic and Antarctic exploration owe much. Fiala used the *Terra Nova* in Franz Josef Land; Captain Scott took her to the Antarctic.

The seal par excellence is the harp. As an adult it carries a gray-colored patch on the back, shaped like a harp, for which it is named. The harp yields more oil than the hood and the young are easy to handle. Because it gathers in close herds, less time is required in hunting it.

After they have been down to the Banks, the harps work northward to a vast sea eddy eastward of Belle Isle Strait, and also in to the Gulf of St. Lawrence to the west of the Magdalens. Now they are the sport of wind and weather of stormy March, and until the coming of the airplane spotter the seal skippers had nothing but their own judgment and experience to bring them to the herd.

The harp seal seeks new ice—that is, ice a few inches thick that forms in the open leads between the heavier ice. Only in new ice can the harp bore bobbing holes and get to its young, which are born on the new ice.

BABY SEALS ARE AS WOOLLY AS GOSLINGS

The baby harp looks like a fluffy white muff with two large, liquid brown eyes peering out. It is as woolly as a gosling. Later the hairs become longer and whiter, until in about 20 to 25 days the young seals roll the white coats off in their movements around the ice and become "ragged jackets." This white, woolly coat is replaced by a hair coat covered with dark spots the size of an American quarter-dollar.

In its first days the puppy seal is helpless and dependent on its mother. It

© Holloway

PICKING UP A PAN OF SCULPS

One to two months of the hardest kind of work faces a man who signs on a sealing vessel. His "crop note" guarantees him an advance of $9. For four seasons, 1920 through 1923, the shares of men on the most successful ships varied from $63.88 to $74.90. Men of the *Imogene* earned most from the 1929 trip, which paid them $80.16 shares. The *Viking* had a bad time of it, earning only $9.46 per man. Therefore the *Viking's* 148 sealers got nothing except the crop for their services from March 7 to April 8 (see page 130).

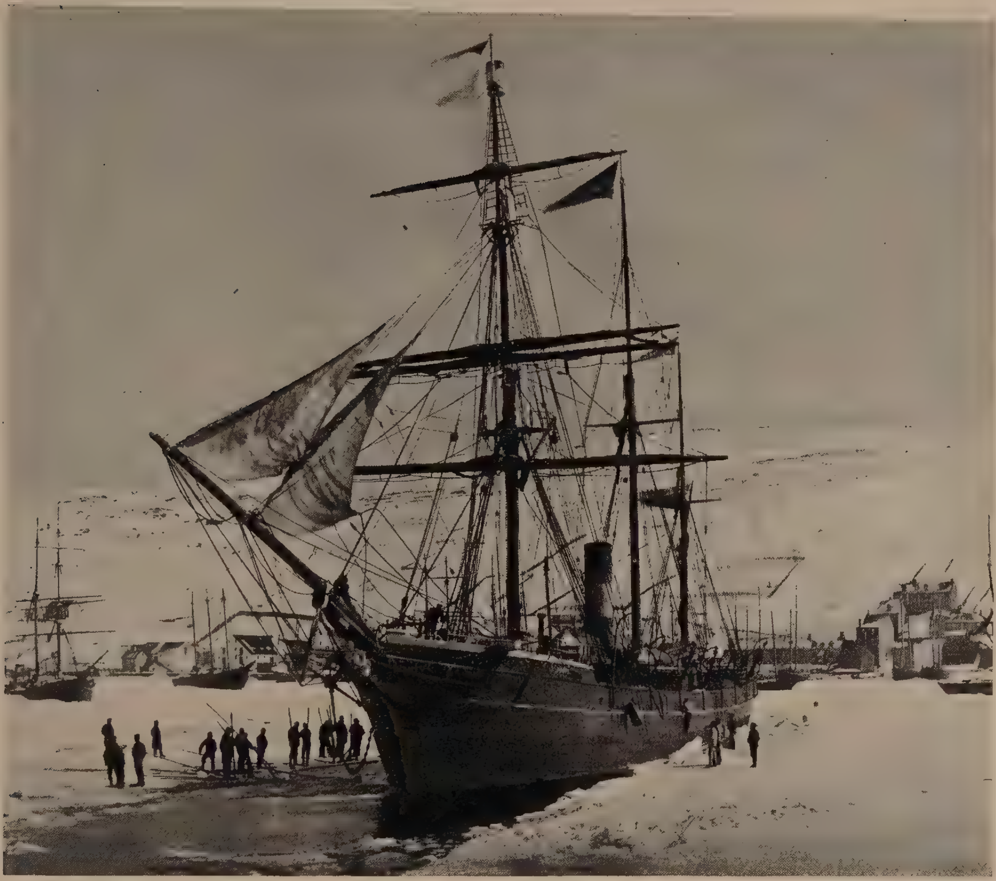
whines like a baby. The weight at birth is about seven pounds. Drinking its mother's rich milk, it puts on a pound to a pound and a half a day.

Early in the morning the mother seal leaves her puppy to seek food and to wash herself. She breaks the new ice formed in the bobbing hole and slips through into the water. At times she will swim long distances in search of food. The wind and current drift the ice along, shifting the floes to and fro, around and about; and yet she will always return to the hole that she has left and always find her offspring!

I have moved the young whitecoats around, changing the places in a group of 30 or 40. When the old one comes, she will nose this one and that one until she finds her own.

When a young seal first strikes the water he backs out. He is afraid of it. He looks and looks at it, but at last he decides the water is his real home and he rolls in.

Evidently the migration of the hoods and harps has been going on for centuries. Each year for a hundred years the hunters of Newfoundland have sought the herds soon after whelping time. Not only the young, but also the old seals, the bedlamers (a corruption of the French *bête de la mer*), two to three years old, are hunted. But still they come. About 150,000 seals



Photograph by S. H. Parsons and Sons

VETERAN AND VICTIM OF THE ICE

The *Proteus,* which hung up sealing records, took General Greely north to Lady Franklin Bay in 1881. Later, sailing to the relief of the party, she was sunk in the ice off Cape Sabine.

whelp in the Gulf of St. Lawrence and about 300,000 off the Atlantic coast of Newfoundland.

THE SEAL CATCH NOW IS LESS THAN ONE-THIRD ITS FORMER VOLUME

At one time probably half a million seals bred annually. To-day the herd has been reduced by half. There is a great difference of opinion among Newfoundland sealing men as to whether the seals are becoming scarcer, but it is a matter of record that in late years the annual catch has been in the neighborhood of 200,000 sculps, in contrast with earlier years when the catch ran to 700,000.

Some people wonder about the killing of all these seals for the sake of their oil and skins, but when one takes into account the number of fish the large herds destroy, the seal fishery is a great boon to Newfoundland. It has been estimated that when the seal herd gets on the Banks it consumes three million pounds of cod per day. I have cut the seals open myself and have found their stomachs filled with capelin, herring, and small cod, which swarm in the Gulf of St. Lawrence in great numbers.

As I was saying, sealing is a hard life.

Men on board a sealer are jammed in as tight as sardines in a box, particularly in the smaller wooden vessels. Going out, every available bit of space is filled with coal, with ice-fighting equipment, sealers' chests, dunnage bags and sealing gear, and men as thick as flies around a molasses puncheon. If we are lucky to get

SEALERS, INSTEAD OF HORSES, RACE IN NEWFOUNDLAND'S SEAGOING DERBY

The islanders hazard thousands of dollars annually on the sealing sweepstakes. Wagers are made on the first vessel in, the hour of arrival, date, and number of sculps aboard. The man, woman, or child who draws the first vessel in port with a load gets the biggest prize.

Photographs by George Harding

BUCKING "SLOB"

If the ice is early coming down the St. Lawrence, it is heavy in the gulf—five to eight feet thick. Some places it rafts up 50 feet high and looks like polar basin ice. At other times it is so level one could skate for miles and miles or run an automobile on it. Again, it is tumbled about as if an earthquake had struck it.

Photograph by Capt. Robert A. Bartlett

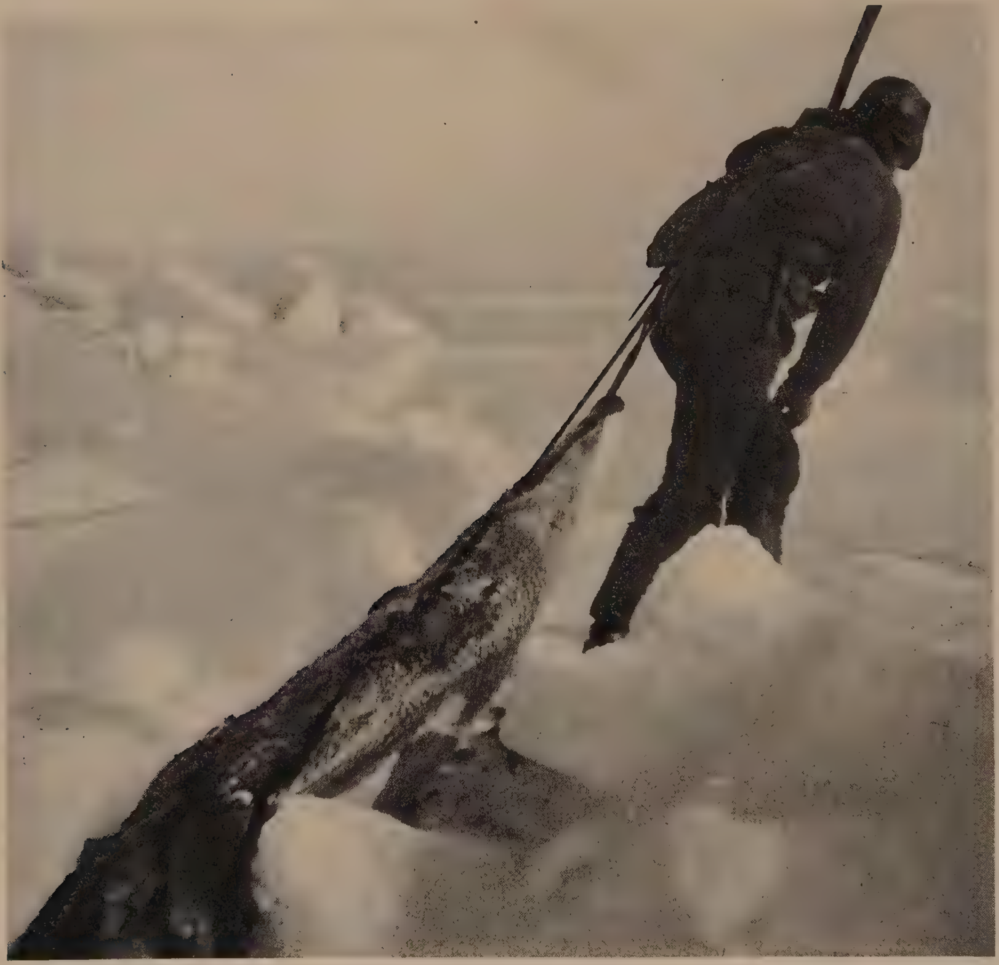
"STARBURD! STEEEAY! PORT! STEEEAY!"

The *Viking*, skippered between 1904 and 1923 by Capt. William Bartlett, father of the author, fights the ice. Fridtjof Nansen, the Norwegian Arctic explorer, made his first trip north in the *Viking*.

Photograph by George Harding

NIPPED AND SUNK WITH 19,600 PELTS

The *Grand Lake*, pride of the seal fishery, was lost with a load of skins, on her sixth annual trip. Her crew of 203 men escaped over the ice to the *Vanguard*. Nature, as if to compensate seals for lack of means of defense, has given them a home guaranteed to discourage their enemies, both wild and civilized.



Photograph by George Harding

"SCOTIN' HIS TOW" OF FAT

A young author in sound health, who went out one year to the seal fishery, put his shoulder to sculp-hauling through snow, over ice rafters and across leads. He lasted half an hour; sealers keep at it all day. A sculp is the skin of the seal with the layer of fat adhering to it. Whitecoat sculps average about 37 pounds in weight.

a quick pick-up, many of the men are "burned out" by a big cargo of sealskins, which takes up their bunk space, and they've got to double up in already crowded quarters.

There is some relief in the watches, when one man is out and another man can use his berth.

THE SEALER IS "FINICKY" ABOUT HIS FOOD

A sealer carries provisions for two months and a half—70 to 80 barrels of potatoes, 100 quintals of codfish, 80 barrels of flour, 35 barrels of pork, many pounds of tea, molasses to sweeten the tea, butter, turnips, and beans.

Could some of the old sealing crews take a look at what's going on now, they would be shell-shocked with wonder. They'd think the fishery was ruined on account of luxurious living. They had nothing but hard biscuit and tea, pork and duff, with little grease in the duff. No soft bread whatever.

On ship we have what we call Solomon Goss's birthday. He has a birthday three times a week — Sunday, Tuesday, and Thursday. On these days for the noon meal we get duff. For duff, flour (a barrel or more to a batch) is stirred with water, currants, and molasses. With a blade as large as a canoe paddle, the cook mixes it into a paste; then he adds shortening—fat from boiled pork.

The dough is packed into canvas bags. These bags are two-men-duff size or three-men-duff size. The cook puts all the bags in a big boiler on the galley range and boils them for two to three hours. Another boiler alongside contains pork. When the duffs and pork are ready the cook calls the roll, and one man of each three messmates comes to the galley and gets the allotted share of pork and duff for himself and the other two men, waiting for him below in the quarters.

As the men come by, the cooks stab the duffs with miniature pitchforks, lift them out of the boiler and douse them in iced water. Then they deftly skin the bags off the duffs, which fall into the men's pans.

There are no tables or messboys to wait on the men.

On Sunday morning the crew gets "brose"—boiled bread and codfish with pork gravy spread over it. Butter, fresh beef, salt fish, potatoes, and turnips are whacked out to the men at different times, and they can prepare a meal for themselves any time they want to, except on Solomon Goss's birthdays, when the range is filled up with boilers.

Tea is made in big kettles, five gallons at a time. On duff days the men make their own tea with tea leaves the cook gives them or that they have bought with their crop money.

The afterguards have it better. The chief engineer, "Marconi" (radio man), second hand, barrelman, and doctor dine with the captain, while the officers dine in the mess room. The galley forward is not used by the afterguards at all.

YOUNG SEAL FRIED WITH ONIONS IS A FAVORITE DISH

When we get among the young seals we boil or fry the seal meat. A mess crowd will cook a bit of seal with onions and butter for themselves. It is good; sometimes, it seems to me, much better grub than the afterguard gets.

The men cook everything about a seal—livers, lungs, hearts, brains, flippers, and body meat. Seal tastes like mutton—very good! Personally, I would rather have seal meat, cooked the way sealers cook it, than the best porterhouse steak; and in the North it prevents scurvy.

As a rule, we leave one flipper in a pelt. Some skippers make their men cut out the flippers. With 30,000 or 40,000 young seal sculps, the weight of this flipper would be 25 tons, I suppose. We have our Harry Lauders in our Newfoundland seal hunts. But among the men, on the whole, they like to bring in the flippers and peddle them around St. Johns, where they get 25 to 50 cents a dozen for a string.

Some of the sealers have rich friends, who stage flipper parties in the swagger clubs of St. Johns. For this purpose the sealer ices down flippers, which may taste a little bit better than the others. A flipper party is a great event, as great as an ambassadorial function in Washington. Social debts are paid with a bridge and a flipper supper, washed down with French and Portuguese wines.

AN INGENIOUS METHOD OF OBTAINING FRESH WATER AT SEA

Now, about the fresh-water proposition. If a vessel were a tank itself, it couldn't hold enough water for all hands and the steam boilers. What do we do for fresh water? When we leave port a couple of thousand gallons are in our tanks. We don't use that. Just as soon as we get into the ice, we use pinnacles. These pinnacles are formed by the rafted ice (see page 108).

The crew cuts this pinnacle ice and dumps it into a steel tank on deck, to which a pipe runs from the engine room, bringing live steam that melts the ice. The water has a tallowy taste, but we drink it all the same. What the eye doesn't see, the heart doesn't feel.

Early in the season it is very hard to get fresh water when out on the ice. Only when it rains or the sun is warm do drinkable pools form. So the sealer has either to bring water in a canister or eat an orange. He can't suck an icicle, because on a frosty day it will freeze to the lips and tear the skin. Anyway, it is not satisfying.

In Newfoundland we have mountain ash, and from the young saplings we cut

© Holloway

HARVEST OF THE ICE AT ST. JOHNS

Prices for pelts vary from $4 to $12 per 100 pounds for young seals; $3 to $9.50 for old seals. Whitecoat pelts average 37 pounds; skins of bedlamers and old seals weigh between 45 and 200 pounds. During the 1929 season 3,709 tons of sealskins were taken, and were sold for $364,351.59.

the bats or clubs which are the sealer's chief implements. They are small, tough, and easy to handle, about seven feet long and about half the diameter of a man's wrist. We call them dogwood bats. A groove is cut in the end, into which slips an iron gaff with a hook and a start (spike). With his bat the sealer clubs his seals, and with its aid he vaults from pan to pan or poles the ice; and he can use the hook to pull a seal or a man out of the water. A bat is part of the sealer. We laugh at a man who would leave the ship without his gaff or bat. That betrays a greenhorn right away.

The sealer also carries a rope over his shoulder, Sam Browne-belt fashion, an 18-thread ratline, four fathoms long, and in the end of it is spliced an eye. The other end is pointed with sail twine to make it stiff, so that it can be threaded through the lace-holes at the edge of the seal pelts to lace them up (see page 101).

A knife and sheath and a steel with which to sharpen this knife are part of every man's equipment. He has goggles, a compass, a watch, and a water canister. On his feet he wears tanned sealskin boots soled with leather and calked with steel chisels, three in each heel, and heavy sparables, or nails, in the soles. The steel chisels are about an inch long and keep the wearer from slipping on the ice.

A SKILLFUL WORKER CAN SKIN A SEAL IN A MINUTE

Each man has strapped to his back a small canvas "nunny" bag, in which he carries an orange or two to quench his thirst, some raw oatmeal mixed with sugar,

© Holloway

SKINNING A SCULP AT ST. JOHNS, NEWFOUNDLAND

After the pelts are brought ashore they are fleshed—that is, pieces of meat which adhere to the fat and which would discolor the oil are cut off. This is called the tare. Then the layer of fat is cut from the skin. Nowadays the latter process is performed by machines.

a few hard biscuits, and a piece of seal or pork left over from a previous meal. This is his grub for a day on the ice.

The men go overboard in gangs, or watch crews, 40 to 50 men in a watch. The master watch is responsible for the working of the men and their safety. Each crew tries to beat the other crew, and each man tries to beat the other man. Where the seals are fairly plentiful, the master watch raises a marker flag and leaves some men, and then another flag and more men.

The mother harp goes down a bobbing hole as the sealer approaches. Young seals are saucy and will come for a man until he snogs them with his bat. He turns the dead whitecoat on its back and slits it down the belly. Then he carefully cuts the body away from the pelt, which is the skin with the white fat fastened to it, and then cuts off the hinder daddles (back flippers). One or both front flippers may be removed (see page 123).

The sealer must be quick and he must be careful. Every hole in a sculp or skin costs a man ten cents. A skillful worker can skin a seal in a minute; some have done it in 40 seconds. A sealer who can kill, skin, and pan—that is, haul the pelts to a marker—120 in a day is a good hand. Men have been known to do 300 in a day.

A CAREFUL COUNT IS KEPT OF ALL SKINS TAKEN

As soon as a man has got his tow killed, three to six pelts, depending on his strength and the ice conditions, he laces them up and bundles them together. If the ice is frosty, it is hard to drag the skins along, because the hair sticks to the ice; but if there is water or snow on the ice, the pelts slip along easily. Suppose he comes to a lead; he gets the skins to the edge and throws the rope across as far as it will go. Then he jumps across himself and hooks the gaff into the eye of the rope and pulls them across. If the seals are thick, there may be anywhere from 50 to 100 sculps on a pan waiting to be picked up by the ship. It is all a rush.

© Holloway

SEALERS IN "GO ASHORE" RIG

Along about the last of March, if we haven't been fortunate enough to get a trip of young seals, we begin to look for the old ones. We follow along north after the herds. The seals are now very wild and we must shoot them with rifles.

No skin is put down the hold warm; it would spoil. The master watch stands at the hatch with a tally stick. Hands are bundling the sculps into the hold.

"One, two, three, four," they shout one after the other.

"Eighteen, nineteen, twenty."

"Score," yells the master watch, as he notches the tally stick with his knife.

"Heave down one for the rats," he yells.

Down goes another sculp. To every twenty pelts one extra skin is added, but not counted. A skipper wants to be sure he's living up to his report to the owners. The tally sticks are turned in to the captain, who, at the end of the day, puts down in his book what is stowed below.

THE OLD WOODEN SAILING SHIP DISAPPEARS FROM THE SEAL FLEET

In the days when sealing was carried on in sailing vessels, there were always ten or a dozen boys aboard. The idea was to break them in young. The old captains always had the future welfare of their ships and crews in mind. These ships, being square-rigged and propelled through ice and water by sails, and then, in calms, by tracking and poking and prizing, needed men who knew their business from ice to truck and stem to stern—all the evolutions and sail management, the working of canvas and dragging of ropes. Day or night, blow high or blow low, there was no let-up, for those were the days of iron men and wooden ships. Boys trained in this school knew nothing else.

Photograph from Holloway

THE "AURORA" UNLOADS SEALSKINS AT ST. JOHNS

The camera could not record the odor. Keep to the leeward of a sealing vessel, is good advice. Yet, by the sealers' standards, the "fat" is fresh. Men pack layers of skins with "salt" (blocks of sea ice) and no skin is put in the hold warm, because a single putrefying pelt can spoil a cargo.

When a boy was 17 years old he could handle a ship as well as a boy can handle a catboat in Long Island Sound to-day.

Nowadays, with all the machinery in vessels, a boy hasn't a chance. A skipper is no more than a conductor aboard a vessel. The captains of steel vessels want the very best seasoned men available. Except for the few wooden ships remaining, the greenhorns of Newfoundland would be out of luck.

Therefore, the only way young boys can get to know vessels is to stow away. This is what they do. I was making a trip myself, and when the ship was searched before pulling away from the dock we found two boys, 10 or 12 years old, stowed away in a bread box on deck. We had to put them ashore. Other boys were luckier.

In the days before wireless there was no communication. When the boys succeeded in stowing away, they were carried along, and their relatives didn't know whether they had been drowned or what had happened to them. Now the radio reports the names of all boys who succeed in stowing away on sealers. On some of the vessels last year there were as high as twelve boys stowed away.

There are many hardships to sealing, and one of them is the danger of ice blindness. Landsmen call it snow blindness, but we call it ice blindness. It may seem a strange thing to say, that, notwithstanding the bitter lessons that the sealer experiences from time to time, he still gets ice blind. Although he carries goggles, somehow or other—it may be carelessness or indifference on his part—he fails to wear them. The result is that after being on the ice two or three days half of a crew

Photograph courtesy Captain Cochran

THE "BEAR," AN ANGEL OF MERCY IN THE BERING SEA

Purchased by the United States Government from her Newfoundland owners, this old sealer served many years in Alaskan waters. Peary engaged various Newfoundland sealing vessels for exploration after the hunt was over, among them being the *Kite,* the *Falcon,* the *Diana,* the *Eagle,* and the *Erik.* On June 22, 1884, the *Bear* and *Thetis,* which had gone north with Newfoundland ice pilots, rescued the Greely party.

may be out of commission. We lecture them, swear at them, tell them we will stop their shares unless they wear goggles; but you can't make them.

It is a serious thing; it is a terrible sensation. I don't know of anything worse. I have been blind myself in the North. It is like having sand thrown in the eyeballs. Water runs out of the eyes. With a good dose of it, men have almost become insane.

My recipe is to wear goggles day and night; then you get used to them. The trouble is men raise the glasses to wipe the sweat out of their eyes and forget to pull them down again. Then, before they realize they are in danger, they are blind.

GETTING LOST IN FOG OR ON ICE FIELDS IS A GRAVE PERIL

Then, again, there is the danger of falling in the water when a long distance from the ship. Here is a sealer who has slipped into the water. He has "gone down till his cap floated" and he is soaking wet. His "buddy" has fished him out with a gaff. A gale of wind is blowing—freezing weather and no shelter. But he has to get those wet clothes off or have them freeze on him as stiff as the pillar of Lot's wife. The two seek the biggest pinnacle, and in the lee of it the wet man strips off his clothes. His buddy lends him all the clothes he can spare, while they wring out the wet ones. It is a terrible job. I have been through it, so I know. It is an awful task to haul the clothes on, but it has got to be done.

The chance of losing his men on the ice in a fog or blizzard is a worry that always besets a captain. It must be remembered that this work goes on at the worst time of the year, when gales of wind and snow are the usual thing. Before the time of radio and the reports of well-equipped weather bureaus at Washington and Toronto, the only intimation of bad weather was from a skipper's "horse sense" and the barometer. A good skipper can smell weather; you can't fool him.

THE SKIPPER OF A SEAL SHIP SHOULDERS MANY RESPONSIBILITIES

Every morning a skipper must decide whether to put his men on the ice or not. At times he is torn between anxiety for his family men and the profits for his owner.

He orders the men overboard, let us say. Away they go. The skipper often wonders to himself if they will all turn up. In 1914 the fleet was all together on the front. The weather was threatening, but some captains put their men overboard, hoping that the day would end fine. But out of the northwest came a terrific blizzard. Wind and snow jammed the ships, so that they could not get to their men. Lakes of water opened between the men and the vessels. In the raging storm many men fell through the cracks and froze. When the weather cleared next day the steamship *Newfoundland* had lost 77 men!

On another trip we were in the gulf, on the *Hope*. Father left instructions that he be called at dawn. I was up before dawn and it was wild then. About 8 o'clock the weather came. Fortunately, we had not put anyone out. The vessel lay over on her side. A man could hardly stand on the ice. The *Hope* was all right, but the steamship *Greenland*, on the other side of the island, had put all her men out, and during the storm 48 perished. Scarcely a year went by but one or two ships were lost. The building of steel vessels and the use of wireless to receive weather reports have cut down losses in recent years.

SOMETIMES A SHIP ANCHORS TO AN ICEBERG

There is much danger of a ship being crushed by the ice pans swinging together and rafting the ice against the ship's sides—nipping her, we call it. Then there is danger of being driven on an iceberg. At this season of the year icebergs are on the sealing ground.

Of course, they may be a godsend. If a skipper, with his ship jammed in the moving floe, drives close to a grounded berg he can sometimes free himself and come up in its wake and make a line fast. Anchored to the iceberg, he may be lucky enough to have the seal herd drive along by him, borne by the current and winds.

Some ships are nipped; others are caught in the ice and are drifted helpless on reefs. The *Huntsman* was one of several vessels caught in a northeast gale off the Labrador coast. The ice carried her and some of the other ships inshore. Crews of the other ships got safely ashore and reached Battle Harbor; but the *Huntsman* drove over a reef and ripped her bottom out. On this reef a rock stuck out at high water.

The men at Battle Harbor went on the hill next day for a look. They were amazed to see something moving on Fish Rock, about three miles away. They went out in a boat and found Solomon French, the solitary survivor of the crew of the *Huntsman*. He had been hanging to the rock for 30 hours. Both of his legs were broken. It is unbelievable, it is uncanny, nothing short of a miracle, that he hung there, continuously battered by ice. One of the men set his legs and he afterward went sealing with father in the *Panther*.

IN THE GRAVEYARD OF THE ATLANTIC

Newfoundland's seal fisheries have few sadder tales to tell than that of the *Southern Cross*. After making a quick pick-up of seals, the *Southern Cross* was almost home. Ten hours more and her crew and cargo would have been safe in St. Johns. Off Cape Pine, early in the morning, she was caught in a gale and sank with 174 men. Except for one life belt picked up on the coast of Scotland some months afterward, not even a stray bit of wreckage was ever found.

When master of the *Leopard*, I once had a very narrow shave. When only a few hours out of St. Johns, bound for the gulf, I struck a heavy easterly gale and ran to the ice for shelter. I was afraid I would lose my deckload of coal and equipment if I stayed in the water. Before I could get around Cape Race, I struck on Black Head, a graveyard of the Atlantic, at 2 o'clock in the morning.

The *Leopard* carried about 103 men. There was a good swell in the ice and it was so pounded up that we couldn't walk ashore on it. It was so deep that it was like quicksand—bottomless. A step in it and we would sink to our shoulders.

We had to rip up the deck sheathing, and by using these boards and oars we made a road over the ice to shore, which was only a cable's length away. When I left the vessel her bridge was in the water. By the time we got ashore the sea hove in, and when dawn broke there was nothing to be seen of the *Leopard* except some wreckage along the cliffs.

HOWEVER GRAVE THE RISK, OFTEN A CREW'S PROFITS ARE SMALL

What do the men get out of all this hard work? The vessel may make a quick pick-up and be through in a few days; again, vessels have been out for two months and returned without a seal. The only guarantee a sealer gets is food and a crop note, equivalent to $9. He works on shares. One-third of the net earnings is divided among the crew. That includes everybody except the captain, who gets four per cent. He takes the same risk as the crew—no seals, no money.

Shares have run as high as $238, but the average is about $60. This is not much, but it comes at a time of the year when a little money looks good. The Newfoundland fisherman is a pretty independent individual. He owns his own home—every nail in it. Usually he has money in the bank. He has a horse, a cow, and a boat. He raises his own potatoes and turnips, catches his own fish. Each family has a sheep or two and the women spin and weave their own wool. If the share of the sealing trip covers the family's few needs, then what they get in the cod fishery or mines during the summer is profit.

On the arrival of a vessel with a trip of seals, the sculps are landed by the crew. Pelts are weighed in scales. They are spread on the dock, but the scent rising from them makes St. Johns no bed of roses. You can smell a sealer almost as far as you can see him. But, after all, the money is clean.

Crowds of boys get the job of fleshing seals—that is, taking off bits of meat that still adhere to the pelt. Meat would discolor the oil (see page 125).

There's usually a pound to a pound and a half of meat and hair to a whitecoat sculp. This is called tare. On old seals the tare runs anywhere up to seven pounds.

SKILL IN TREATING SEALSKINS

An escalator carries the pelts to a skinning loft, where a mechanical skinning knife does the work of many men and does it more efficiently. It shaves the fat from the skin better than a skinner could do it. The fat goes into a grinder, where live steam disintegrates it, and eventually it is reduced to a fluid state. Finally it goes to big steel vats holding many thousands of gallons. Over the tanks are mounted hothouse glass frames, and the sun shining on the oil clarifies it. This oil is pumped into tankers and brought to Newark, New Jersey, where it becomes a constituent of soap.

The sealskins are tanned and used for various kinds of leather goods. The next time you enter a leather-goods store to buy a pinseal pocketbook, hold the article in your hand and think of its story. Think of the seals tossing on the ice pans off the coast of Newfoundland amid wind and hurricane weather. Think of the hardy men who go down to sea and risk their lives walking on the ocean to take the pelts. Think of the strong Newfoundland ice vessels that bring them home in order to supply the world with pinseal novelties and purses for its valuables.

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ST. MALO, ANCIENT CITY OF CORSAIRS

An Old Brittany Seaport Whose Past Bristles with Cannons and Cutlasses

By Junius B. Wood

Author of "Russia of the Hour," "Seeing America from the 'Shenandoah'," "A Visit to Three Arab Kingdoms," etc., in the National Geographic Magazine

FOUR old salts, smoking stubby pipes just like any picture-book sailors, are gossiping on a sunny rock outside of St. Malo rampart walls. Half a mile across the beach a few hardy resorters are splashing in the chill Brittany surf. The smooth floor of sunlit sand is sprinkled with croquet sets, tennis courts, tents, and camp chairs, children flying kites, dogs digging holes, groups building castles of sand and seaweed, and an occasional strolling native gravely inspecting the strangely clad city visitors.

The fluff and flurry of the 20th century have enveloped St. Malo. The grizzled sons of the corsairs who made England hot with rage for lost ships and who carried the name of St. Malo around the world through the half century before 1825, now sail forth to battle with the gaily tinted herring and the peaceful oyster. An annual fishing cruise to the Grand Banks of Newfoundland is the longest venture.

The stores of merchants who staked fortunes on a single privateering expedition now have other owners, whose modern show windows display bathing suits or high-heeled shoes. St. Malo no longer needs to dare the waves in search of foreign booty. Instead of fleets and armies, excursion boats come with tourists. Syncopated music and the ivory ball tinkle in the casinos until dawn, but the old St. Malo, silent and hard, is back of it all.

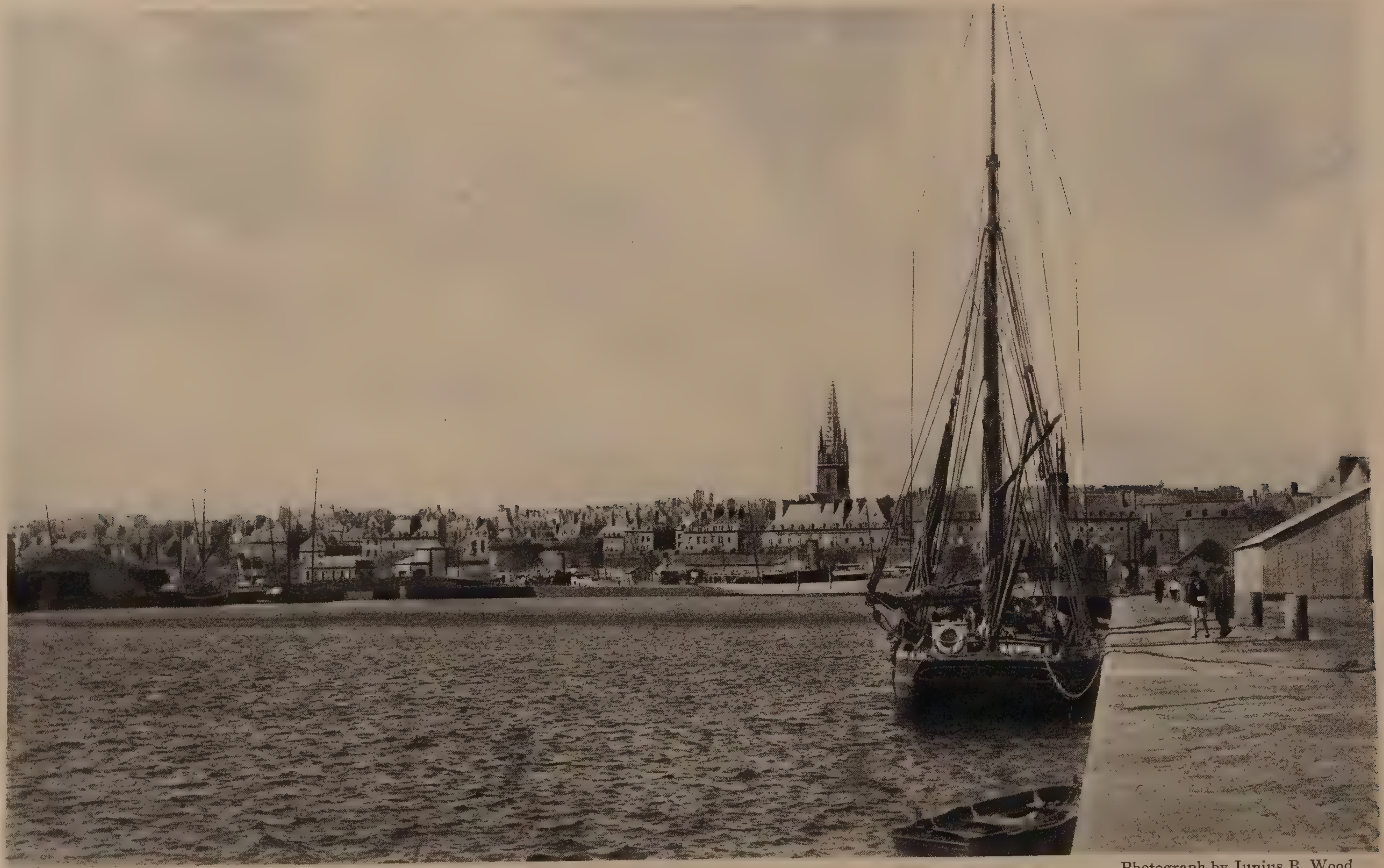
THE MALOUIN TAKES THE SEA SERIOUSLY

The old lure of the sea, the lore of the Celt, and the stout Breton heart persist. Pleasure-seekers may come to rest and frolic on sand and surf, but the *Malouin* has no such use for the sea. To him it is serious, the element from which a living is to be wrested, the inevitable grave—the same as the land.

As I came ashore one day, shivering from a plunge, an old fisherman called out to me, "Why learn to swim? When the ship is wrecked, you drown. It ends quicker."

In the years of its greatness, St. Malo flung to the winds of every clime the colors of France and its own corsair flag of blue with the white cross and sleeping ermine. No other city in France was so well known in the Americas and the Indies. One of its sons gave Canada to France, another captured Rio de Janeiro, another blockaded the Ganges, another took Madras. St. Malo's toll of English shipping was set at 382 warships and 4,510 merchantmen.

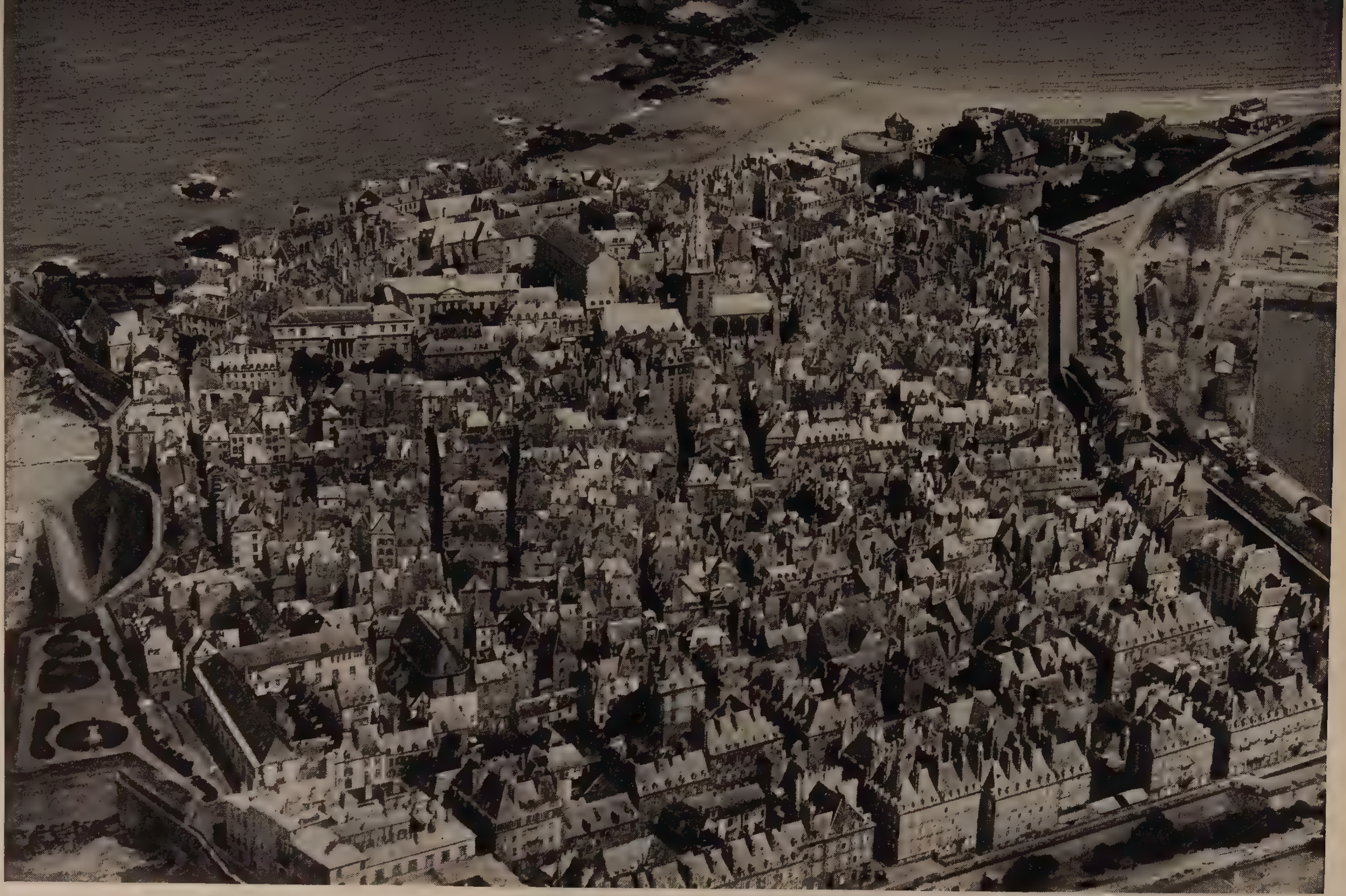
England and Holland sent fleets and armies to batter down the "scourge of the seas." St. Malo fought back as blithely



Photograph by Junius B. Wood

PUNY HEIRS OF THE CORSAIRS' CRAFT RIDE IN THE INNER HARBOR

Here it was, in the brave days of old, that daring adventurers set out in their fast-sailing ships to harass English merchantmen. Now fishing smacks and small passenger steamers are all that remind one of the stirring activities of the ancient sea rovers.



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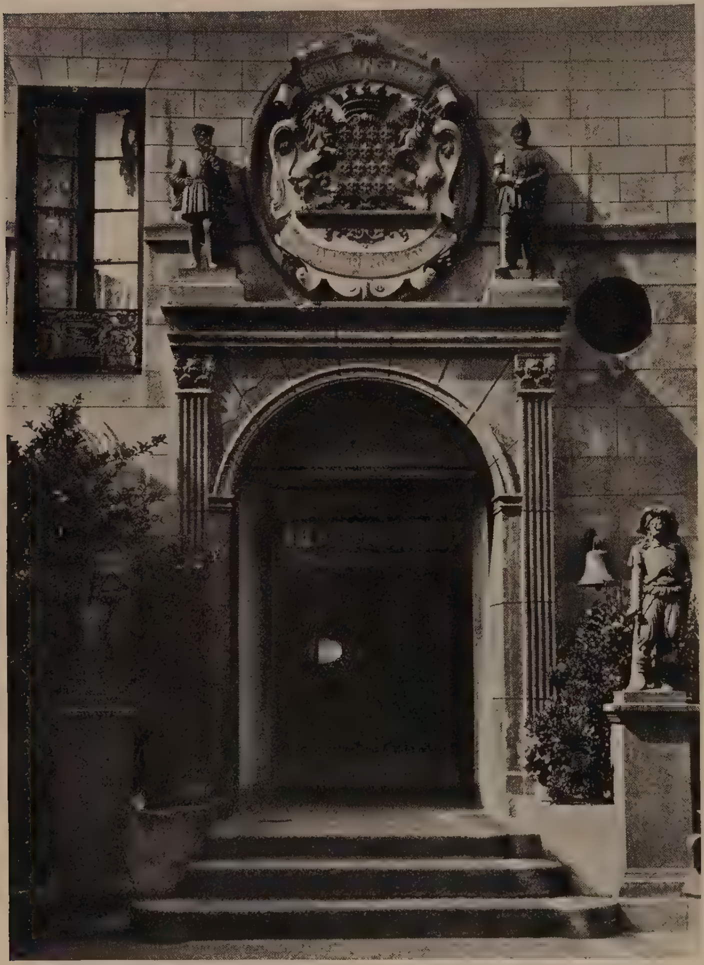
SEEN FROM THE AIR, CLOSE-PACKED ST. MALO BRISTLES



Photograph by Junius B. Wood

CHATEAUBRIAND'S HOME IS NOW PART OF A HOTEL

The famous romanticist, philosopher, and poet, whose coat of arms, with its motto, "My blood tints the banners of France," surmounts this doorway, is revered as the favorite son of St. Malo. Though his parents were only visiting in the City of Corsairs at the time of his birth, they later became permanent residents. A public square and a street bear the name of the great writer.

as it fought with kings of France, dukes of Brittany, or its own triple-headed government. The City of Corsairs loved to fight either on the water or on its own rocky isle.

To-day, as then, the tide rises and falls twice in each 24 hours—30 feet ordinarily, more than 40 when the sea runs full.* Castles of sand and seaweed disappear at the flood, the scars of the day are smoothed—even Canute of Denmark could not sit on that shore—and the waves break against the 12th-century ramparts.

The islands fortified by Vauban stand out black against the setting sun. Clear above the serried hills of steep roofs the crenelated spire of old St. Vincent's pricks the sky of mottled red and green. Grim structures of steel-gray granite, flecked with mica which sparkles in the sun, slope down to the broad ramparts and the squat towers of the citadel outside. St. Malo of the ages endures.

"MY BLOOD TINTS THE BANNERS OF FRANCE"

The old mansion of René Auguste de Chateaubriand is part of the Hôtel de France et Chateaubriand. Over the doorway of the building, facing the courtyard, is the coat of arms of his famous author son, François René de Chateaubriand, with its motto, "My blood tints the banners of France."

When the little Chateaubriand ran through St. Thomas's Gate to play on the sands, the public square which bears his name was a moat and Rue Chateaubriand was The Street of the Jews, the prescribed residence of that race. Later a guillotine was on the square, and then a statue of Chateaubriand by Aimé Millet, the latter now on the terrace of the Casino outside the walls, a bronze philosopher amid the nightly din of modern dance music, clattering glassware, and laughing lovers.

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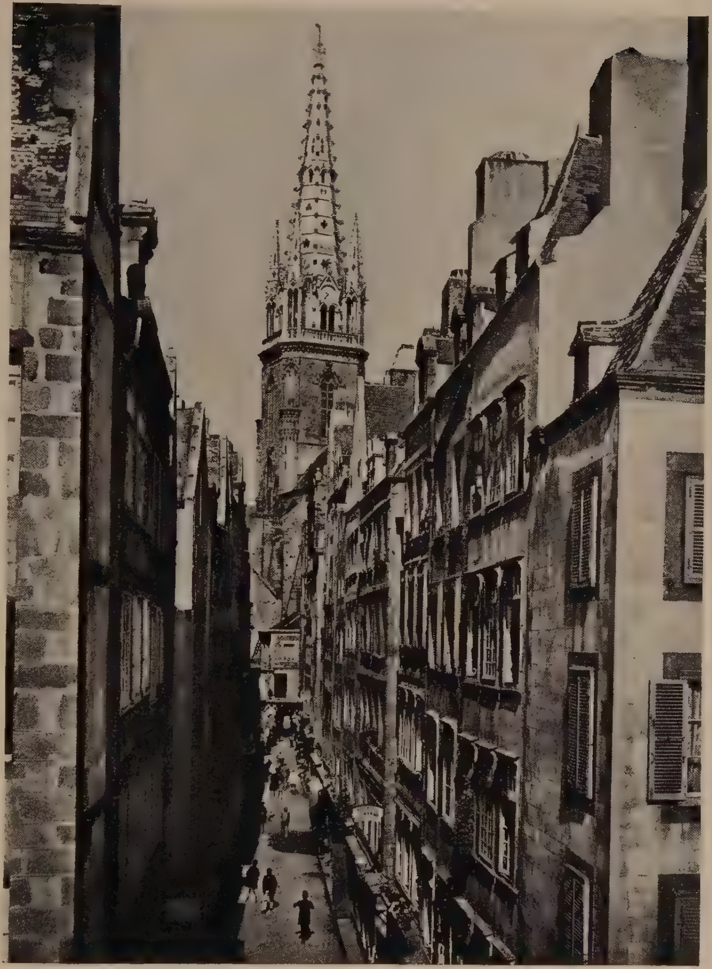
* See, also, "Through the Back Doors of France in a Canadian Canoe," by Melville Chater, in the NATIONAL GEOGRAPHIC MAGAZINE for July, 1923.

"And who was Chateaubriand, Hal?" a buxom matron was asking the family oracle, as the party stood on the rampart promenade and peered at the window of the room in which guidebooks say François René was born on September 4, 1768.

"Some people remember him as an author, but more know him as a cut of beefsteak," witty George explained.

The restaurant historian was wrong. The steak is named after another Breton, Françoise de Foix, Comtesse de Châteaubriant, favorite of François I, who lived some 250 years before the other spelling became famous.



OVER THE NARROW CANYON OF GRANDE RUE LOOMS ST. VINCENT'S

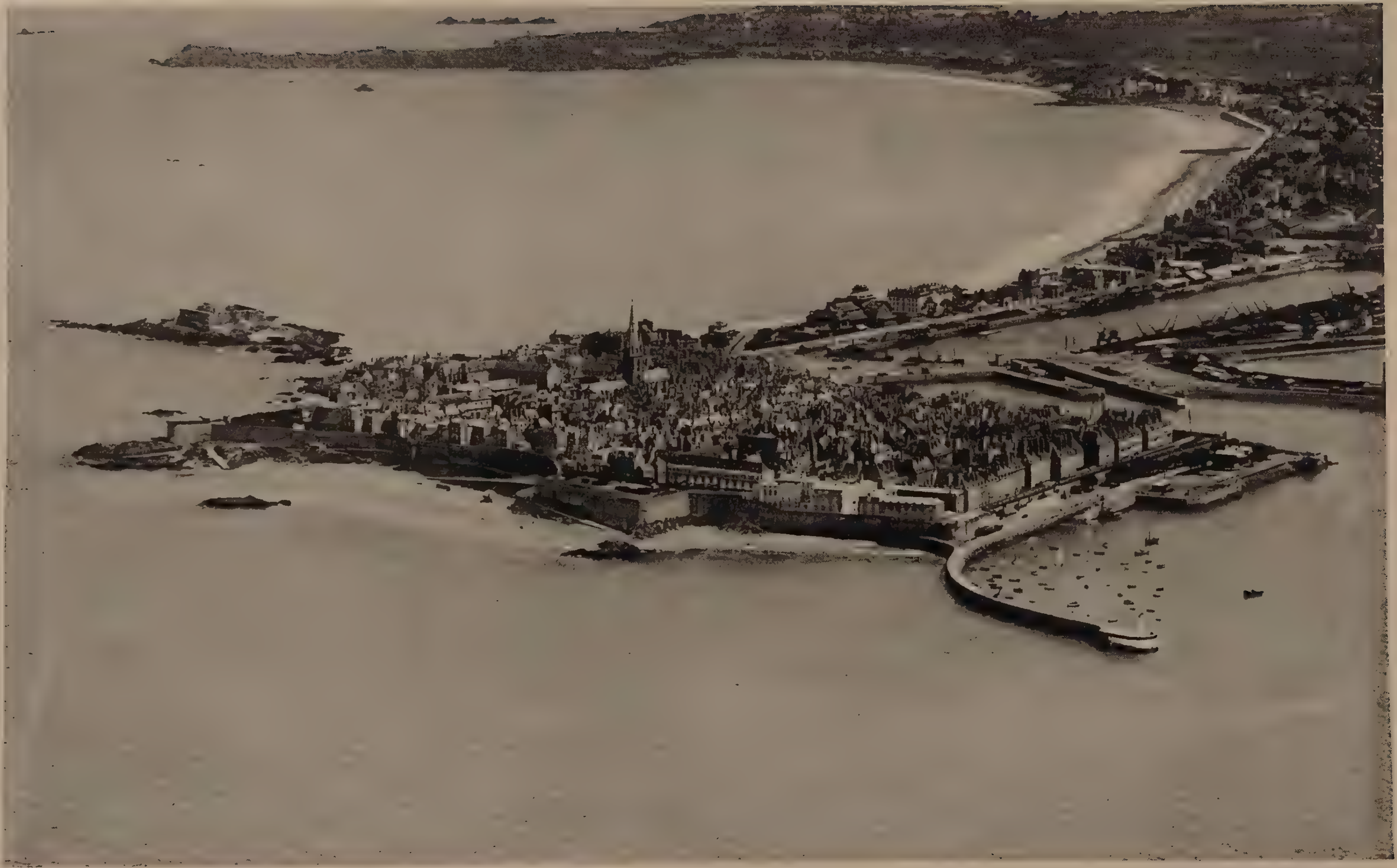
Napoleon III, in his enthusiasm for Brittany, gave orders to build a spire for St. Malo, meaning the Church of St. Malo at Dinan. The architect mistook the Emperor's intention and erected the gift on what was then the cathedral, now church of the first class, of the City of Corsairs. With streets like this, the ancient town will never be troubled by modern traffic (see text, page 151).

ST. MALO'S WHO'S WHO

Blue and white enamel signs immortalize other notable personages of St. Malo. In 1839 the names of most of the public squares and of nearly all the streets, except those leading to the principal gates, were changed to honor those who made the town famous.

The list is long — as Chateaubriand proudly said, "fairly satisfactory for a town which is not so large as the Tuileries Garden."

Old names, suggestive of vanished landmarks—Dancing Cat, Broken Drum, Gluttony, Commune, Lancet, Dames of Light Habits, Big Steps, Little Steps, Harp, Break of Day, Old Butter, Soft Grass, Pillory, Street Sweepers, Hangman—have been changed to make a St. Malo Who's Who. The best known are: Jacques Cartier, discoverer of the St. Lawrence River; Maupertuis, the mathematician; La Mettrie, exposer of quacks; Dr. Broussais, early evolutionist; Porcon de la Barbinais, given a parole by the Algerian pirates and beheaded when he returned; Mahé de La Bourdonnais, captor of Madras and the "governor" in "Paul and Virginia"; Félicité Lamennais, famous agnostic; Archbishop Trublet, whose family antedated



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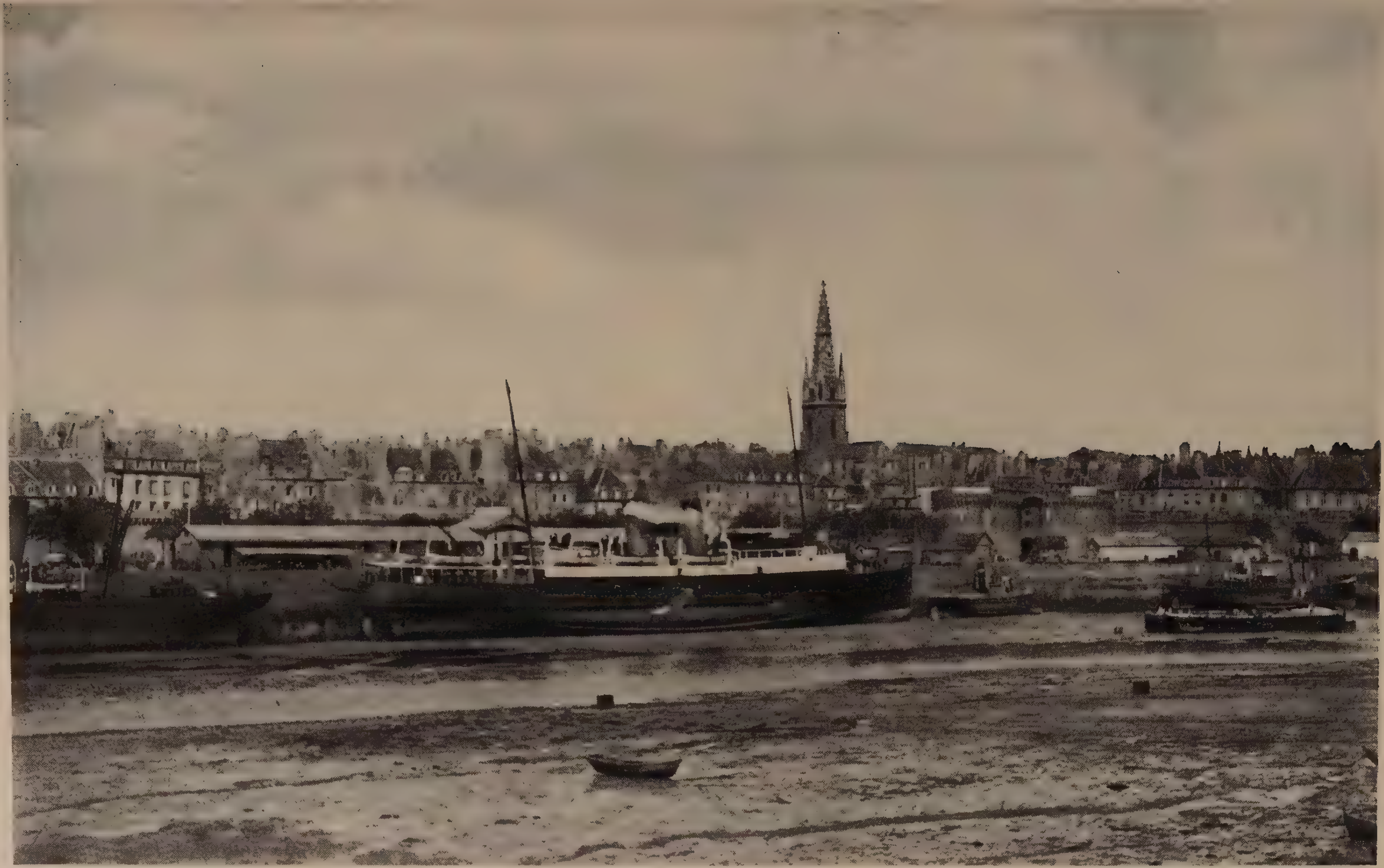
A CAUSEWAY CONNECTS ST. MALO WITH THE MAINLAND

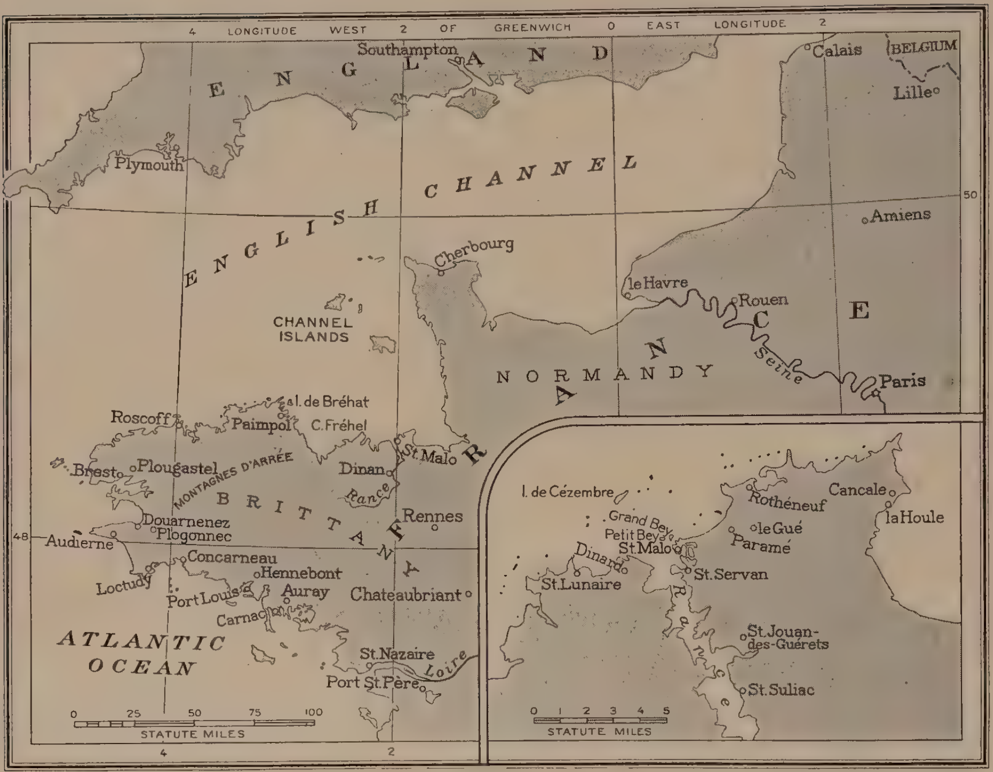
When the City of Corsairs was in its glory, the fortified rock on which it stands was surrounded by water at high tide. Now the neck of the peninsula is never submerged. The Malouin of old built for safety and, since there was only so much space on strongly fortified rock, he must "find room at his elbow" for his tall stone house.



Photograph by Junius B. Wood

WHEN THE TIDE IS OUT, THE JERSEY STEAMER SITS ON THE GROUND

In the days of sailing vessels, St. Malo was a veritable king of the seas, but now large ships find the harbor dangerous and the ocean liners do not put in here. The old city must be content with lesser passenger craft, such as this, which runs to the Channel Isles.


LONGITUDE WEST OF GREENWICH EAST LONGITUDE
ENGLAND
Southampton
Plymouth
ENGLISH CHANNEL
Calais
BELGIUM
Lille
Amiens
Cherbourg
CHANNEL ISLANDS
le Havre
Rouen
Seine
Paris
FRANCE
NORMANDY
I. de Bréhat
Roscoff
Paimpol
C. Fréhel
St. Malo
Brest
Plougastel
MONTAGNES D'ARRÉE
Dinan
Rance
BRITTANY
Rennes
Douarnenez
Plogonnec
Audierne
Concarneau
Hennebont
Loctudy
Port Louis
Auray
Chateaubriant
Carnac
ATLANTIC OCEAN
St. Nazaire
Loire
Port St. Père
STATUTE MILES
I. de Cézembre
Grand Bey
Petit Bey
St. Malo
Dinard
St. Lunaire
Rothéneuf
Cancale
la Houle
le Gué
Paramé
St. Servan
St. Jouan-des-Guérets
St. Suliac
STATUTE MILES

Drawn by J. M. Darley

A MAP OF THE WESTERN PENINSULA OF FRANCE AND OF ST. MALO AND ITS ENVIRONS

The venerable City of Corsairs, an important Brittany seaport for more than a thousand years, is situated on a granite island, now connected with the mainland by a causeway, on the right bank of the estuary of the River Rance (see illustration, page 136).

Hermit Aaron (see text, page 142); de Gournay, France's first industrialist; Admiral Boursaint, wealthy suicide; Count Thévenard, France's first cannon founder, and even Benjamin Franklin, whose thrift struck a responsive Malouin chord.

The stone Croix du Fief, now over a street corner, marked the spot on the original ramparts where the bishop's feudal estate started outside the walls. Its fountain is a city water hydrant, but the old shrine to the Virgin is in the wall.

The bishop's town crier stood under the cross to shout the names of bankrupts, tax-dodgers, short-weight merchants, and those guilty of blasphemy—strange offense for a seafaring town—sentenced to the pillory. Before each Holy Week he droned a warning to Jews to leave the city "during the week they had made Jesus suffer."

St. Thomas's Gate takes its name from a chapel. The Breton sailor, when not pirating, loved to pray, and St. Thomas was his favorite saint. The gate was endowed with its original shrine by a crew who told their credulous fellow townsmen how the patron had saved them from an octopus that had wrapped its arms about their craft.

The grog was strong in those days and the tale was vivid. When the shrine was built, however, the sailors divided St. Thomas's glory, adding to his statue a painting of themselves shooting the octopus from a yardarm.

ENGLISH WATCHDOGS GUARDED CORSAIRS' BEACH

Through the gate from the beach, skirting the Château's Quiquengrogne Tower (see text, page 151), across the Chateaubriand Square and a few steps up the street of the same name, the Venelle aux Chiens (Alley of Dogs) branches off to the left.

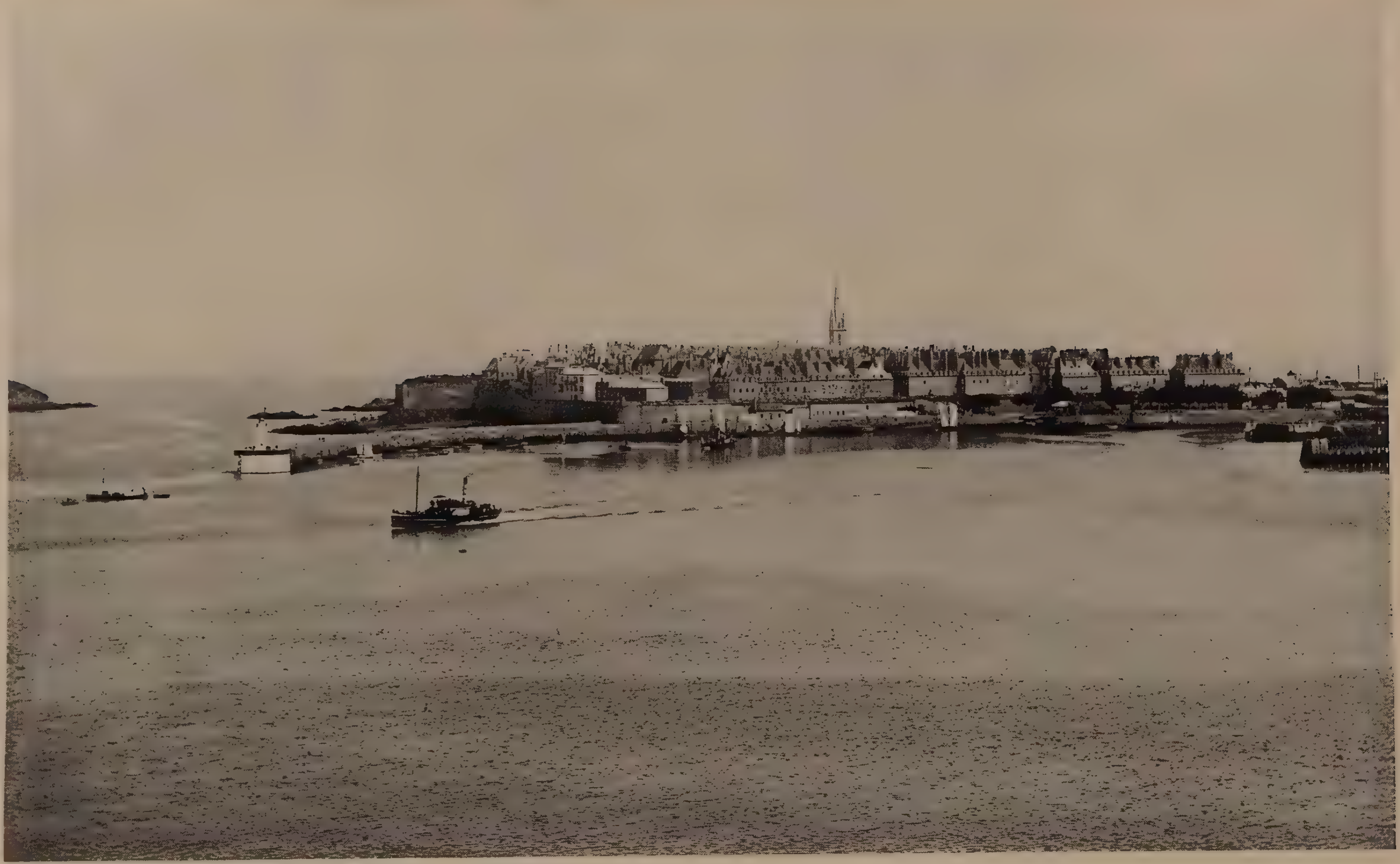
ONCE THESE WATERS WERE NOT SO SAFE FOR ENGLISH SHIPS

The Southampton steamer is seen here entering the harbor between the City of Corsairs and St. Servan, where, in the days of Surcouf and Duguay-Trouin, many a British vessel was taken as a prize (see text, page 131). To-day the Malouins' only tribute from their neighbors across the Channel is derived from the tourist trade.

Photographs by Junius B. Wood

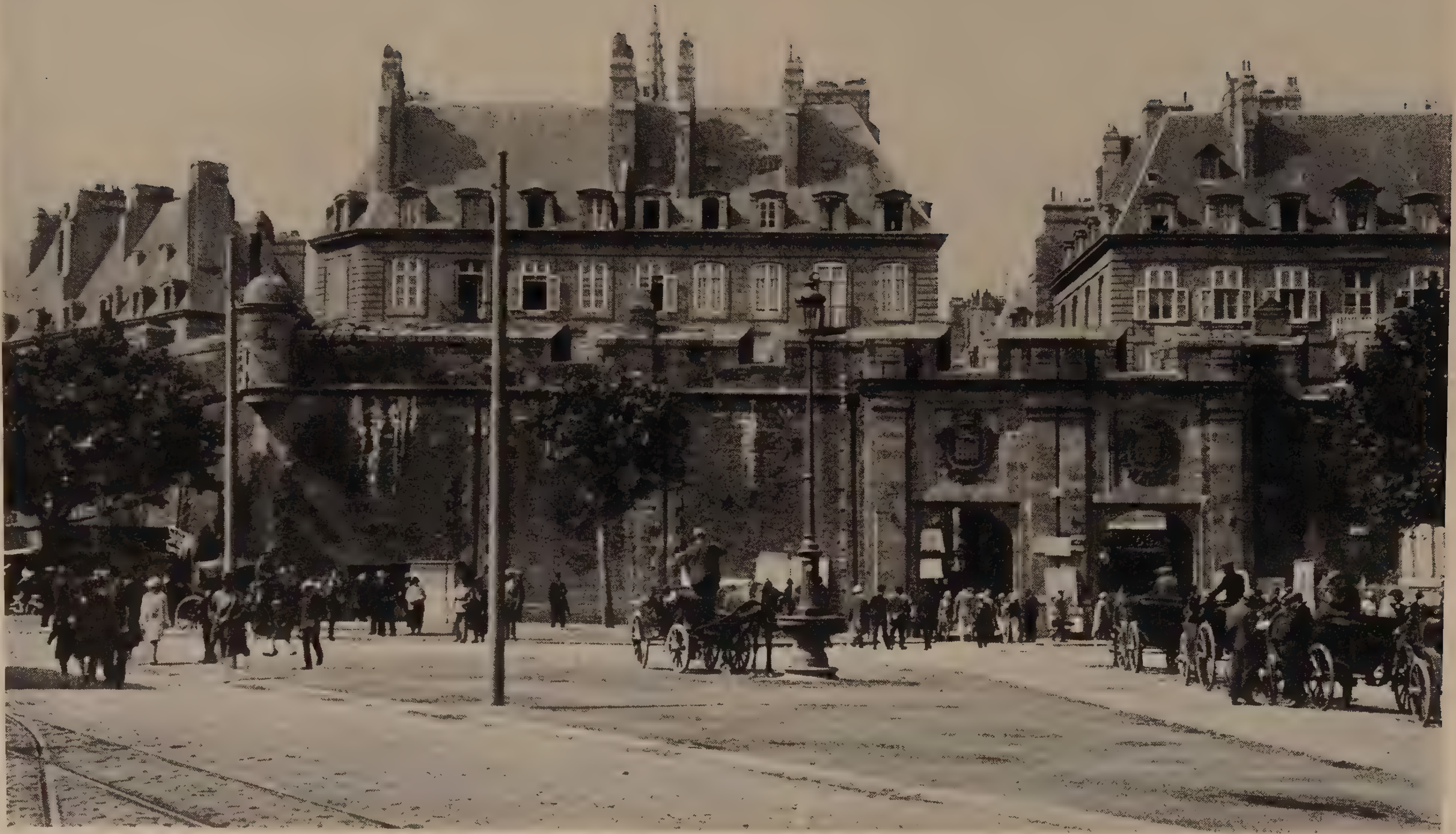
ST. MALO HAS DEFIED THE ROUGH SEAS OF CENTURIES

When the tide is in and a storm rages, the promenade leading cityward becomes an uncomfortable walk: but it is at such times that the town recovers most of the charm of its adventurous past.



A VIEW OF THE CITY FROM THE FORT DE LA CITÉ, AT ST. SERVAN

The corsairs of old could sit in safety in their homes on this fortified rock and laugh at the attempts of their irate victims to dislodge them (see text, page 166). Though the spire of St. Vincent's dominates the city, the building is not on the highest point. St. Aaron's Church, opened for service only once a year, has its foundation on a slightly higher level.



Photograph by Junius B. Wood

TRAFFIC ENTERS THROUGH ST. VINCENT'S GATE

One of the twin portals dates from the early 18th century; the other, carved with armorial bearings and a Breton motto, is modern. A rustic policeman stands inside to prevent automobiles from attempting to drive into the narrow, twisting streets (see text, page 151).

It is so straight and narrow that it might be mistaken for a hallway. In 1155, when St. Malo was comparatively young, 24 watchdogs were purchased in England to guard the corsairs' beach, and it was from these dogs that the street took its name.

In those days St. Malo did not have its inner harbor, where the tides are cheated by locks; its tidal harbor, where 300-ton steamers tie up to the pier and gradually settle down on dry land until the water returns to float them off, or the other works of granite which now make it a port. Tides were the same, and the wooden ships lolled on their sides on the beach while crews made merry within the walls.

Each night at 10, when the great bell rang the "cover fire," the dogs were unleashed on the beach as a menace to thieves and a warning to moist but honest sailors against overstaying shore leave.

When the rampart Bastion of Holland was built, in 1674, and trimmed with 24 guns overlooking the sea, to assist in the reception of William of Orange's Dutch fleet, the dogs were given a bombproof home inside the gate. The barred room remains to-day, a place of thrills for peeping children.

Legend relates that in 1770, when the canine guard had diminished to 12, a certain lieutenant who had tarried too late with his sweetheart in near-by St. Servan, one March night, was chased into the water and there devoured by the dogs.

Dupont (see text, page 165) produces a burial record to prove that this romantic tale is not historically accurate. Nevertheless the dog guard ceased to exist after that year.

A HOLY MAN OF WALES FOUNDED ST. MALO

The modern St. Malo was only three years old when the dogs were purchased, but the city was ancient even then. In the sixth century, a hermit named Aaron had a hut of stone on the rock opposite, where formerly had stood the Gallo-Roman city of Aleth, now St. Servan. One day a holy man called Malo, Maclow, Maclou, Machut, or Maclovius came over the waves from Wales in a homemade stone dugout. According to his memory, he had been born in 520. With the hermit Aaron as an audience, the visitor held religious services on the back of a complaisant whale. The taciturn Malouin has neither sagas nor script and may have confused his patron with Jonah. But no carping historian has proved the tale false.

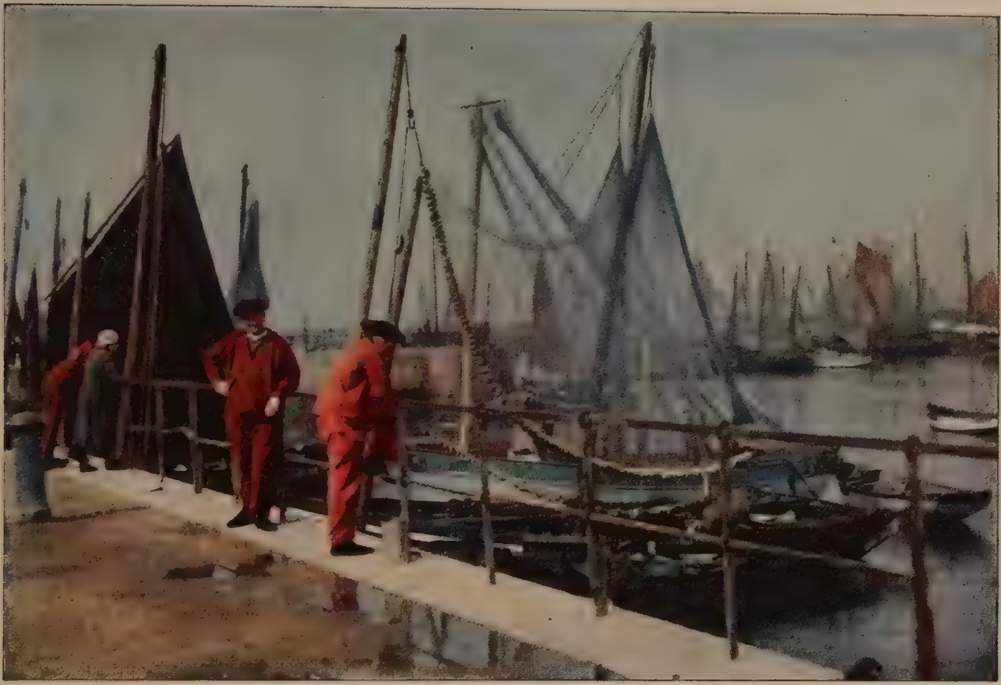
Malo from Wales built a hut of his own and started to perform miracles. He became a bishop in 590. Druid competition eventually chased him to the old province of Saintonge. By 680, however, he had been canonized, and his skull and an arm bone were brought back. Charlemagne's warriors destroyed church and city in 811, and Charlemagne restored them. Otherwise, early life in St. Malo was uneventful.

In 1098 was born Jean de Châtillon, better known to Malouins as Jean de la Grille, from the iron latticework put over his tomb to prevent pious souvenir hunters from carrying off his body piecemeal. He was the founder of the St. Malo that stands to-day. When he became bishop of Aleth, in 1144, most of his flock lived across the bay, on Aaron rock, the site of the present St. Malo. His predecessor had given the rock to the Benedictine monks, and it was only after eight years, during which Jean made four trips to Rome on foot, that the Pope ordered the Benedictines to return the rock.

WARLIKE BISHOP BUILT THE ST. MALO OF TO-DAY

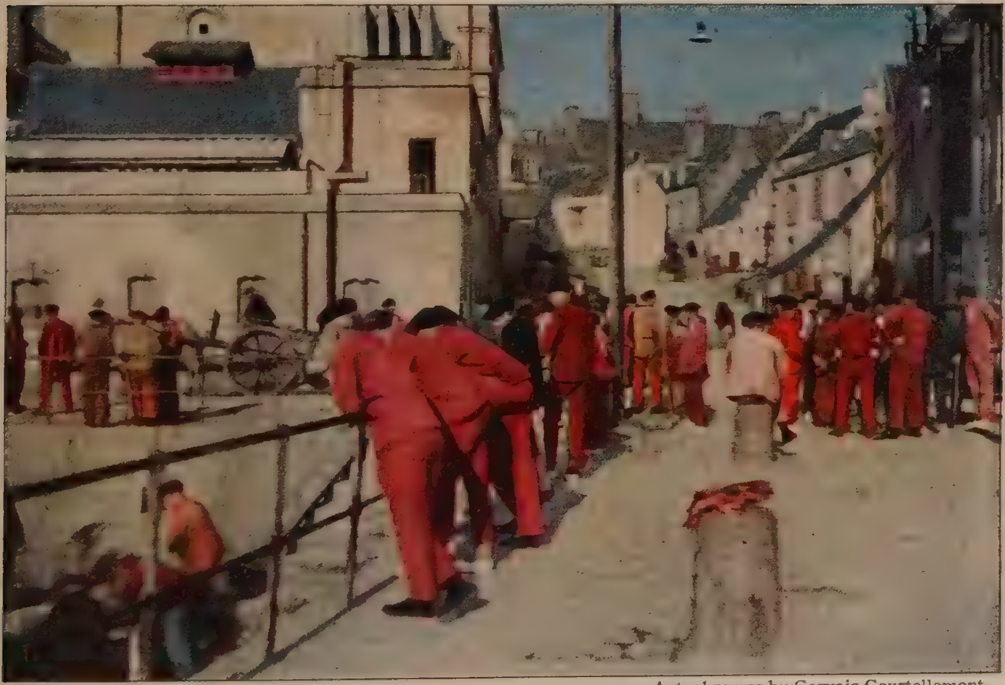
In 1155 he started the walls that still form the sea face of the ramparts. So well were they built that they withstood enemy cannon fire and the pound of angry waves throughout the centuries. Jean was both temporal and spiritual ruler. In his time immense establishments of the church and holy orders in the little city elbowed merchant corsairs' imposing storehouses and mansions with double floors and two-story cellars cut into the rock to hide sea booty from tax collectors. The Rue Jean de Châtillon of the present day leads past narrow stone stairways, dark passages, and vast caves that date from the time of the warlike bishop.

Belted by its ramparts, St. Malo had no room to grow. Its gray stone houses were built high and close, and cellars were deep. In 1700 it had 163 ships, with crews of 12,000 men—a figure equal to the population of the city, which is little larger even now.



ON SUNDAY DOUARNENEZ SHIPS ARE HOME FROM THE SEA—

With gossamer nets strung from the masts to dry, the fishing fleet drowses in the Sabbath peace of the harbor.



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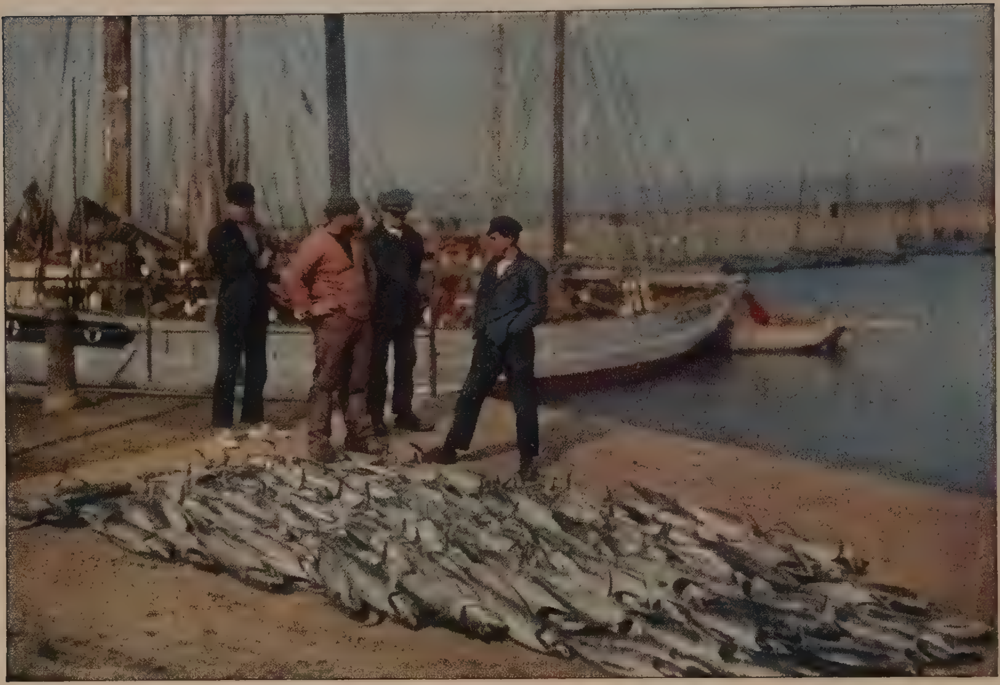
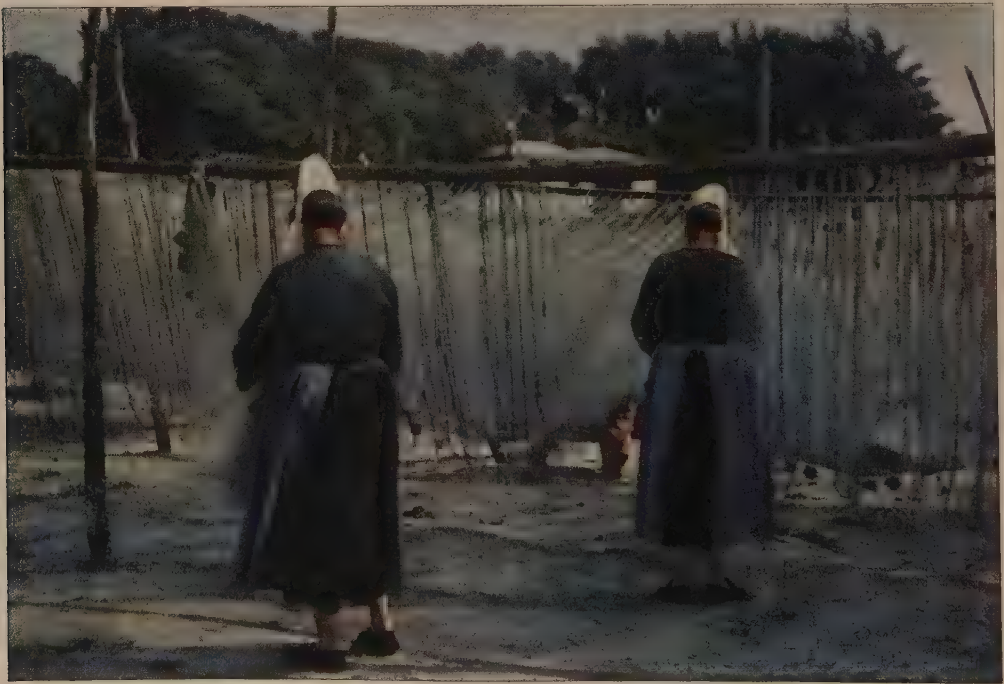
BUT MONDAY MORNING FINDS THE WATERFRONT ALL ASTIR

Knots of gaily clad fishermen discuss plans for the voyage while their fellows make the boats ready for the start.



TUNNY AND BONITO GLADDEN BRETON HEARTS

A catch like this means much to the men who wrest a precarious livelihood from the sea.



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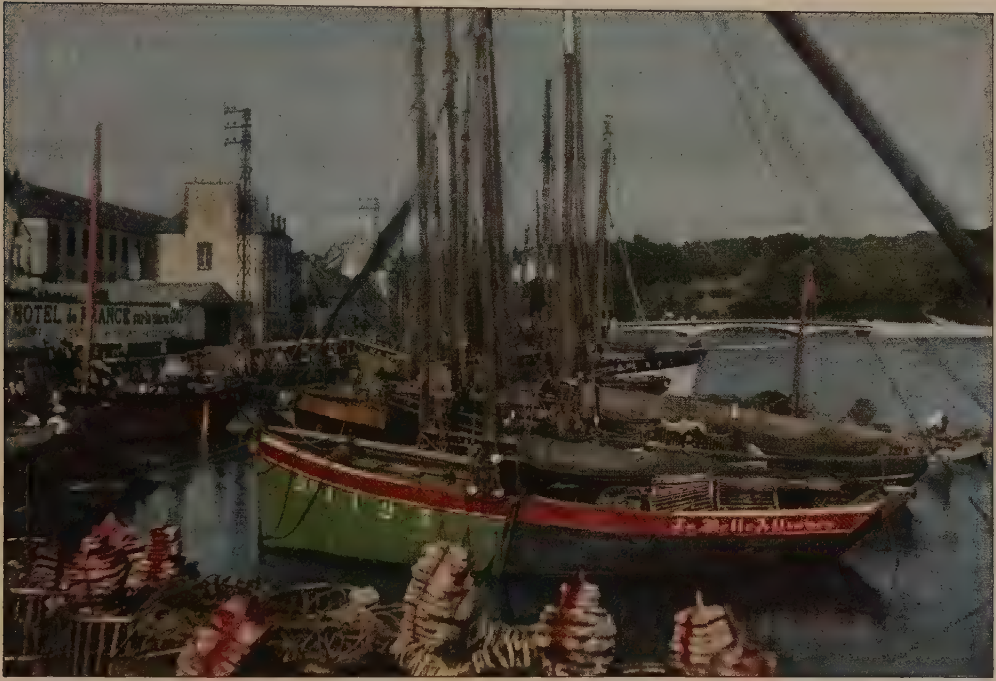
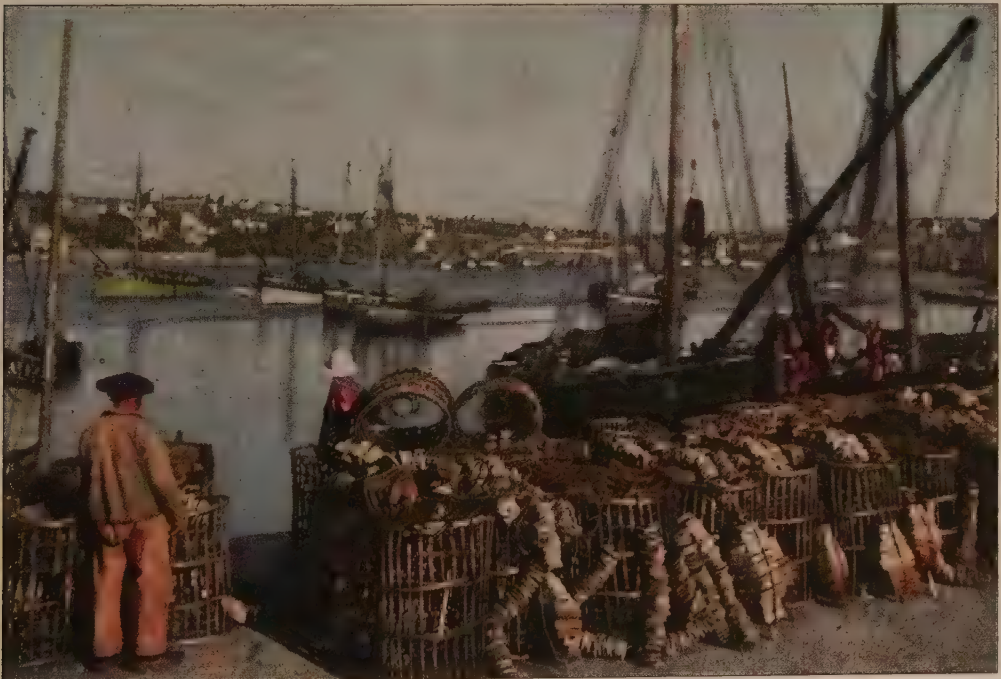
FISHERMEN'S WIVES REPAIR THE PRECIOUS NETS

In the sands at Loctudy these skillful women are working too busily to turn around for a photograph. Their stiffly starched bonnets are characteristic of the Pont-l'Abbé district.



FISHING GEAR LINES AUDIERNE QUAYS AT LOADING TIME

Equipment and bait are made ready along the harbor rim before being put aboard the boats.



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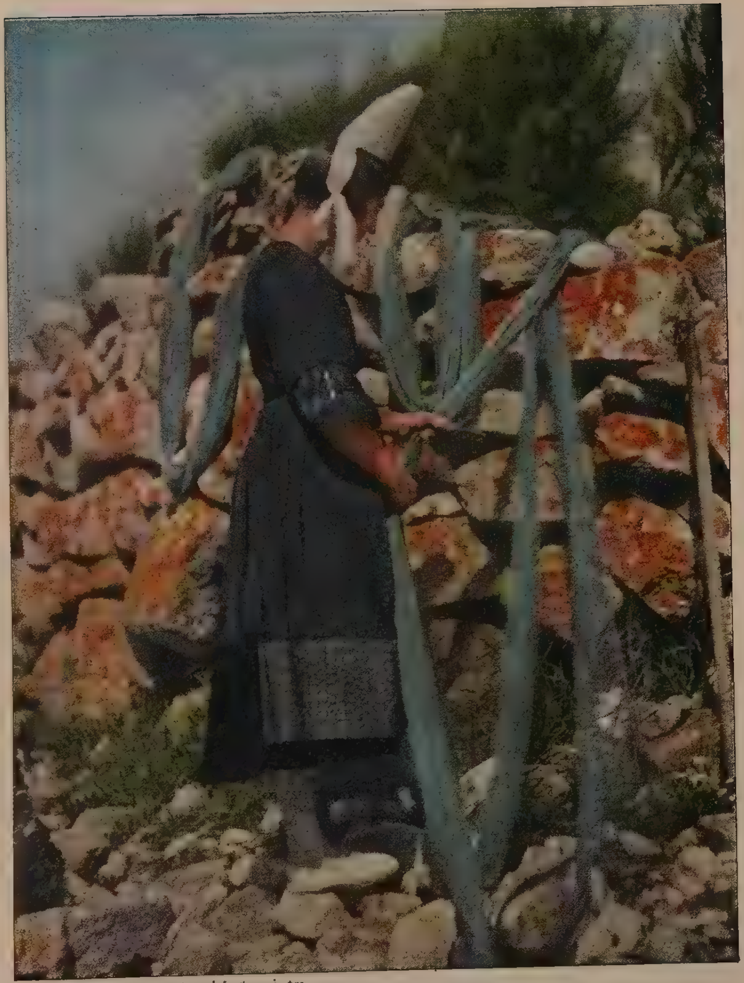
BOW NETS SPELL DOOM FOR THE WARY LOBSTER

These basket snares are ready to be carried by sailors to the staunch little vessels that venture from Audierne harbor to the Morocco coasts in search of crustaceans.



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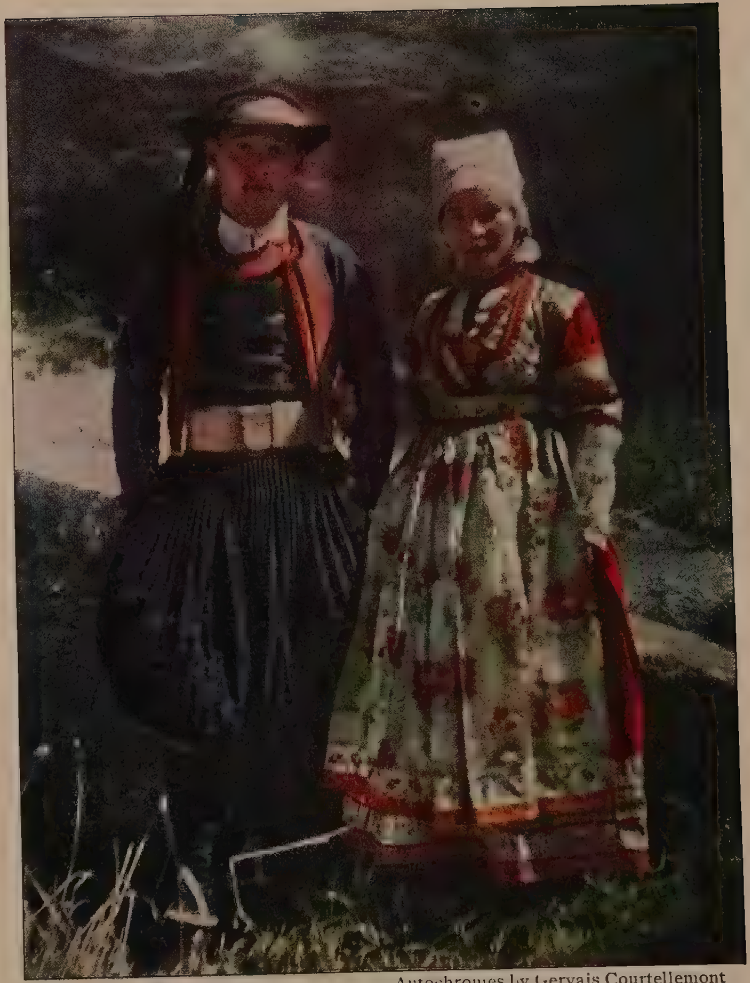
HER TASK REQUIRES DEFT FINGERS

Sardine nets—so costly that many fishermen can purchase only one in a lifetime—are often torn by porpoises. Here a woman is mending broken strands. Her cap, badge of her canton, is one of many distinc-



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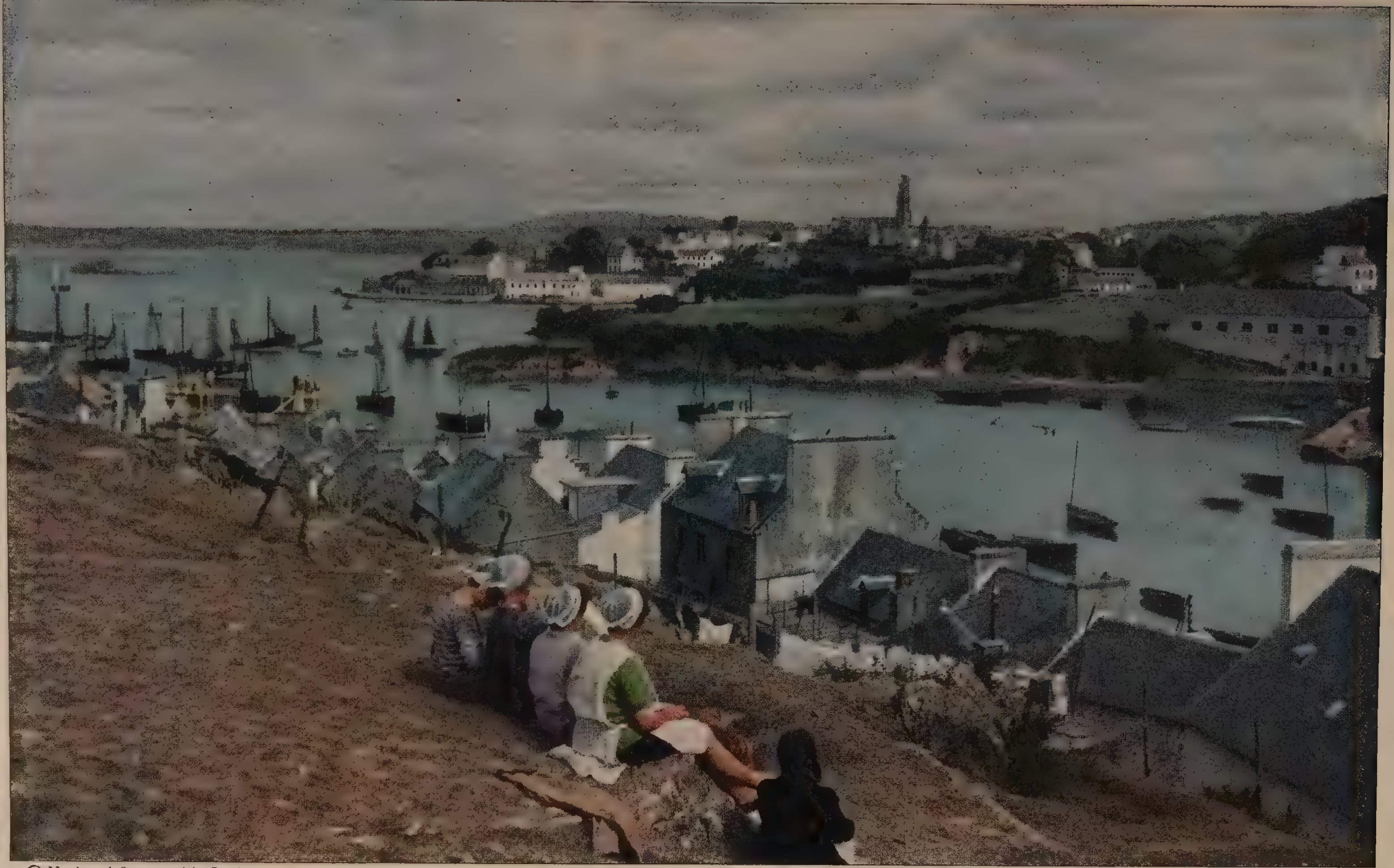
PEASANTS WEAR STRIKING OLD COSTUMES ON FÊTE DAYS

In the dress competition at Concarneau, city of comely folk, this couple's 1830 attire wins prizes. The young woman's apron is a treasured heirloom. And as for her companion's accordion-pleated trousers—such *Gallia braccata* amazed Cæsar!



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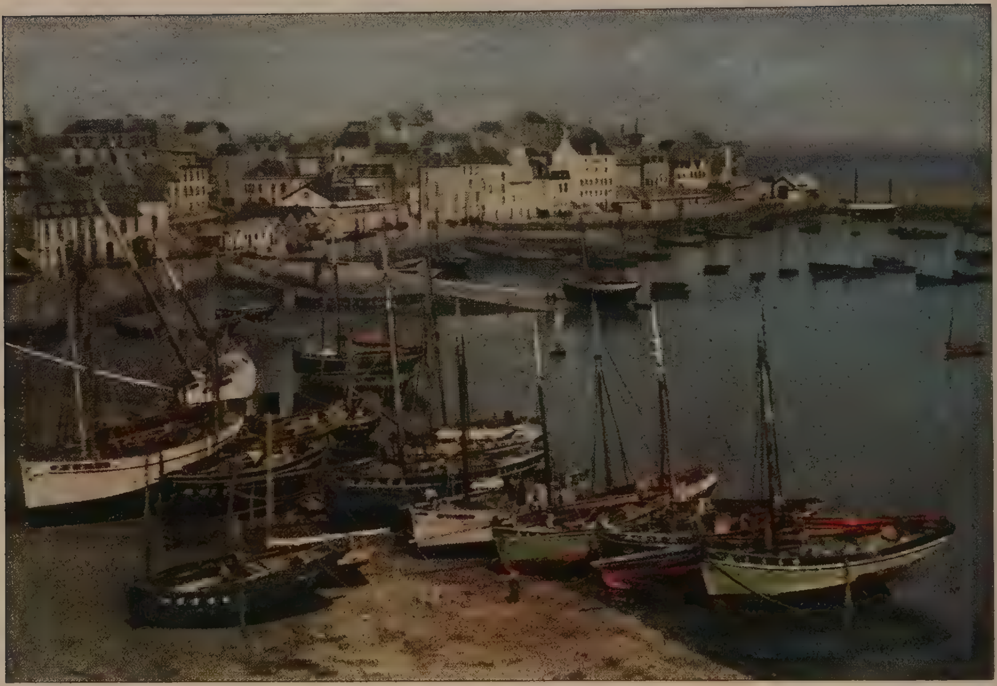
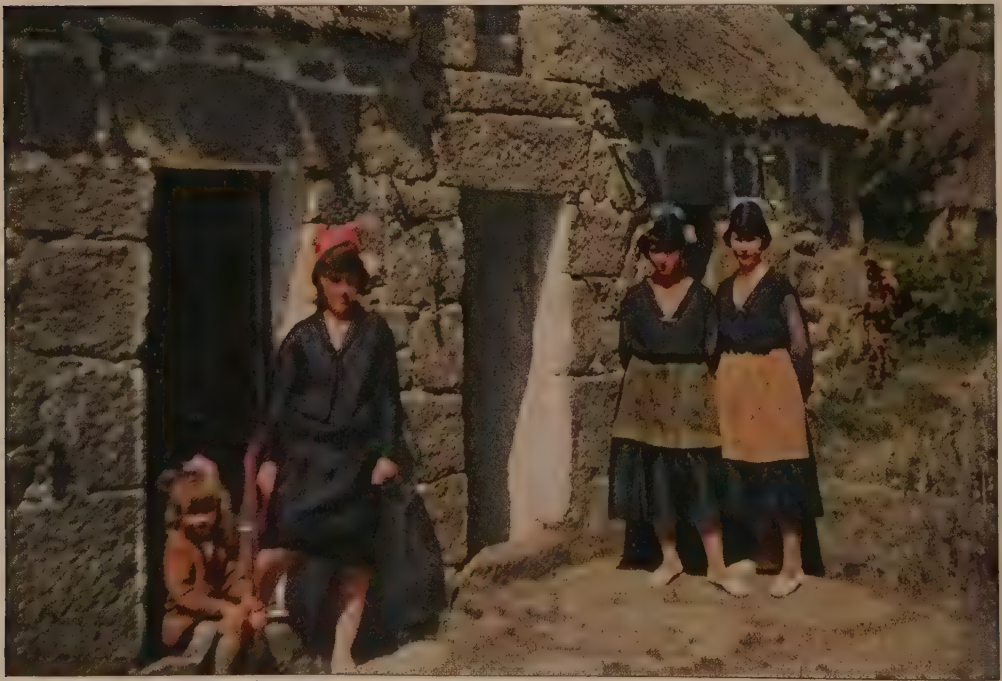
ON STILL DAYS IT IS PLEASANT TO LOOK TOWARD DOUARNENEZ FROM TRÉBOUL HILLS

When storms are raging, however, the wives and children of fishermen may stand here or on the quays of the town and wait in an agony of anxiety for ships that perhaps will never return to the quiet waters of the Little Harbor. Bretons live by the sea and learn to endure with fortitude its savage moods and rejoice when its humor is kind.



LOW TIDE LEAVES THE LOBSTER FLEET AGROUND

At Douarnenez the tide rises and falls more than 20 feet.



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BRETON CHARM IS NOT DEPENDENT UPON QUAINT COSTUMES

Here old-style architecture is in contrast with the up-to-date attire of young factory girls who live in an ancient thatched cottage.

THE OLD PIER OF DOUARNENEZ LURES BUT BAFFLES ARTISTS

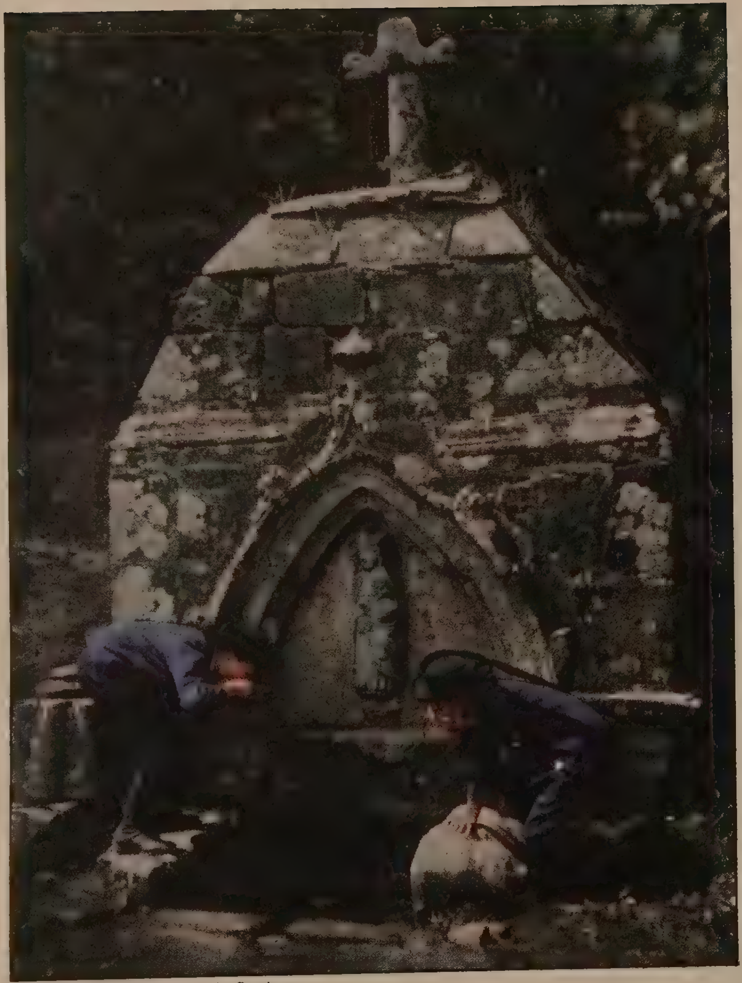
Painters of repute have despaired of putting the real tone of this scene on canvas.

© National Geographic Society

Autochromes by Gervais Courtellemont

ROMANTIC ROSCOFF SHIPS CARRY CARGOES OF VEGETABLES

With the incoming tide these trim sailing vessels will be off for England laden with early fruit, potatoes, and other garden produce.



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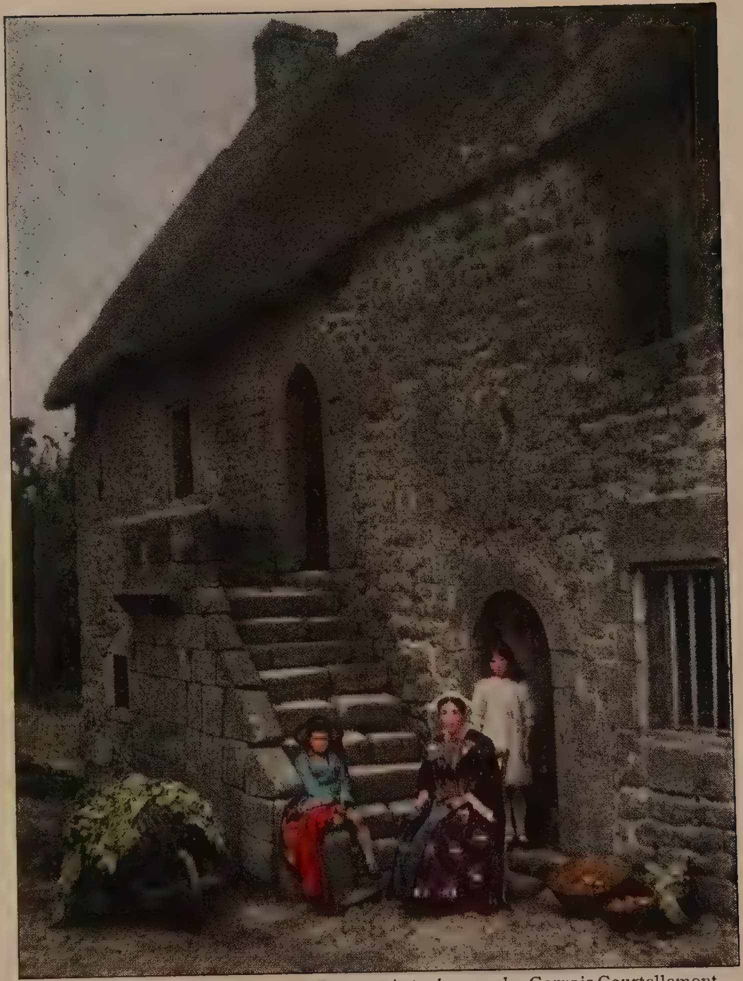
SWEET AND COOL IS THE WATER OF THE HOLY WELL

Breton boys, dressed in gala attire in honor of the Pardon of Plougastel, pause for a drink near the Chapel of Anne of the Fountain.



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AURAY WOMEN STILL FAVOR TRADITIONAL COSTUMES

Old Brittany remains unspoiled at this venerable thatch-roofed farmhouse at Kermarquer, though the children are in modern dress.

The voyages of St. Malo husbands were long. The population increased only 132 a year for 20 years.

To-day a rustic policeman stands inside St. Vincent's Gate, stopping automobilists from driving up the crowded main street and advising them to leave their cars outside the walls, as the little city can be crossed in a few steps (see page 141).

The old Street of the Jews, now Chateaubriand (see text, page 134), crosses the Street of the Sacred Beard and continues, hilly and narrow, as the Court of la Houssaye (from Potier de la Houssaye, who once owned all the buildings thereabout).

Here is the House of the White Horse, the oldest house of stone in St. Malo. On the side of the entrance to its octagonal stairway tower is painted the modest notice of a cabman, who may be seen in front of his door almost any morning, shampooing his horse. A sign in an upper window advertises "corsets made on measure or repairs." Specimens of home laundry hanging in other frames, muddy shoes drying on stone sills, pots of flowers, and milk bottles complete the 20th-century garniture of the historical mansion.

HEADSTRONG ANNE DEFIES THE MALOUINS

This once was the palace of the famous Duchess Anne, twice Queen of France, married to Charles VIII in 1491, and to his cousin, Louis XII, in 1499. Here the 14-year old duchess lived, defying temporal power of bishop, chapter, or city, until she left to become queen, bringing unsubmissive Brittany as her dowry to the crown. Here Catherine de' Medici lived in 1570, two years before she staged the massacre of St. Bartholomew. Thus the paths of two remarkable women crossed, one dead five years before the other was born. The old house of both stands unperturbed.

The headstrong Anne, charmer of kings, is credited with the Château which frowned down on the walls of the free city and stood as a bulwark against enemies who might come by land, and which to-day, with its moats, its quiet parks, and its towering walls half buried in the sand, is only a historic pile sheltering a museum, an exhibit of Breton needlework, and patient clerks collecting taxes and issuing *permits de séjour* to strangers who tarry in St. Malo (see pages 156, 158).

One day in 1424 a breathless boy informed the sovereign bishop that men were staking out a wall just outside the ramparts, on the spit of sand which at low tide connected the rocky island with the shore. Bishop William of Montfort led a procession of monks to the drawbridge of St. Thomas's Gate, threw a pebble over the ramparts as proof that the land was his, and forbade the work. Jean VI did not heed, but finished the Great Dungeon, which still towers above the city, to show that he was ruler in the Duchy of Brittany. His son, François II, built the walls, their embrasured tops then 118 feet above the ground, and had finished the sturdy Générale Tower in 1475. In 1501 daughter Anne completed the task.

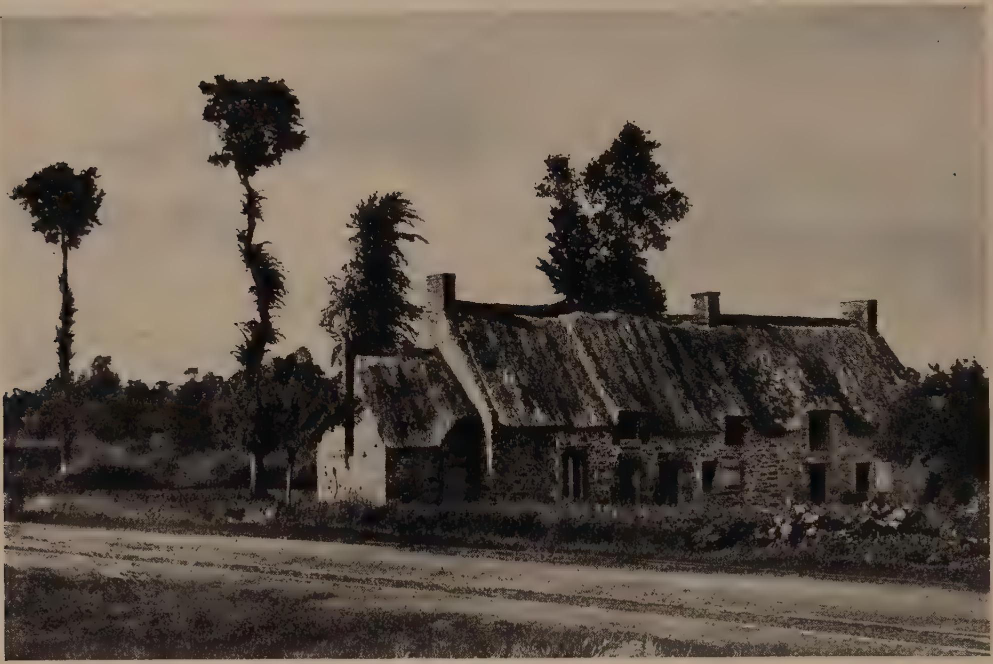
Once when the young queen came to inspect the construction of her defiance to the power of the bishop, chapter, or city, the citizens protested. *"Qui qu'en grogne, ainsi sera, c'est mon bon plaisir,"* she replied. "Though you grumble about it, it will be, for it is my pleasure" seemed such an apt reply that she had it carved on the bulky tower overlooking city and sea. It stayed until revolting citizens hacked it out with stones and hammers on November 15, 1792.

The Château was captured only twice, both times by the French: first in 1488, before it was completed, and again on the night of March 11, 1590, when 55 agile Malouins clambered up ropes dropped over the sides by traitors within.

The sea, with its immense tides, was always St. Malo's defense, but in 1488 La Trémoille left his cannon on the sand, covering them with oiled skins as the waters rose, and resuming the bombardment as soon as the tide ebbed, until city and Château surrendered.

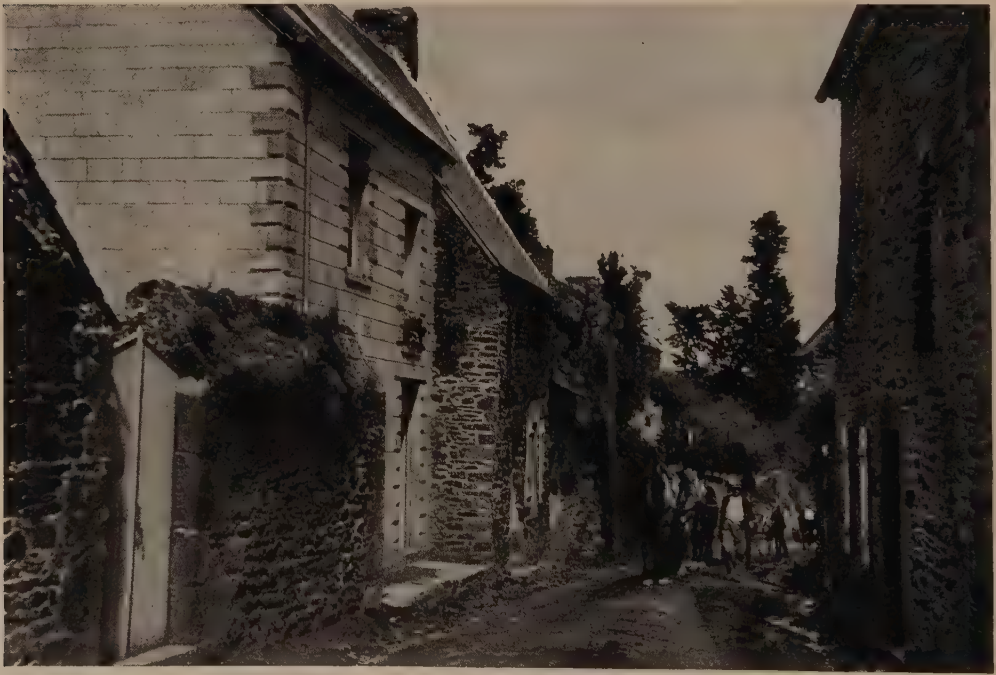
JACQUES CARTIER LINKS ST. MALO WITH CANADA

Whether Jacques Cartier was actually born in St. Malo, or that he was born in 1494, is not certain, but he was the first of that hardy city's great sailors, one of its three greatest. In the summer of 1534 François I started Cartier from St. Malo to find a northwest passage to the East. He had two ships of 60 tons each and Malouin crews totaling 122 men.



A BRETON HOME AT ST. JOUAN-DES-GUERETS

Low-hung eaves and thatched roofs add to the charm of such quaint buildings, unfortunately giving way rapidly to modern structures. The village near by is one of the most beautifully situated along the Rance.



Photographs by Junius B. Wood

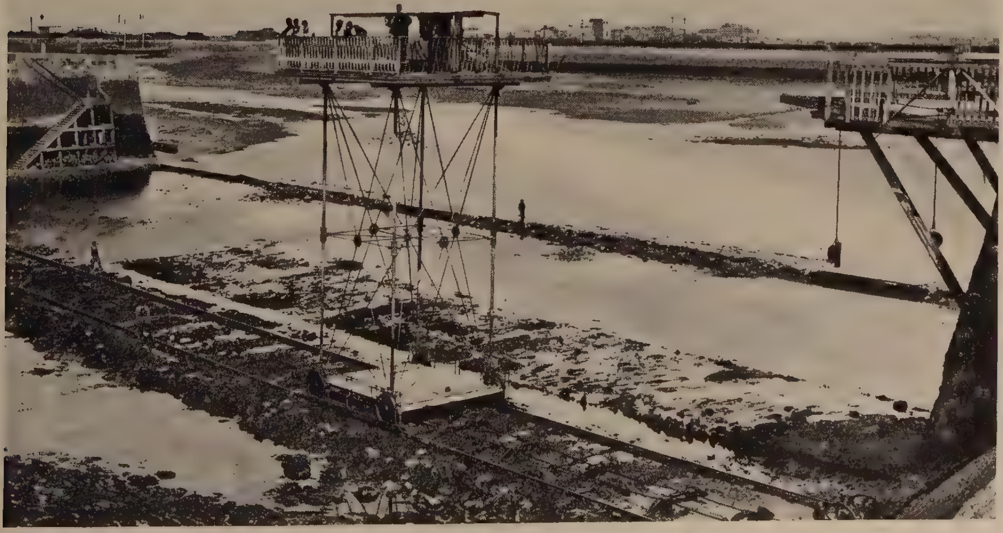
ANCIENT BUILDINGS LINE THE NARROW STREETS OF ST. SULIAC

In sharp contrast to the modernized city of Dinard is this attractive old port town on the Rance, which has changed little since the days of the St. Malo corsairs (see, also, illustration, page 159).

Photograph by John W. McFarlane

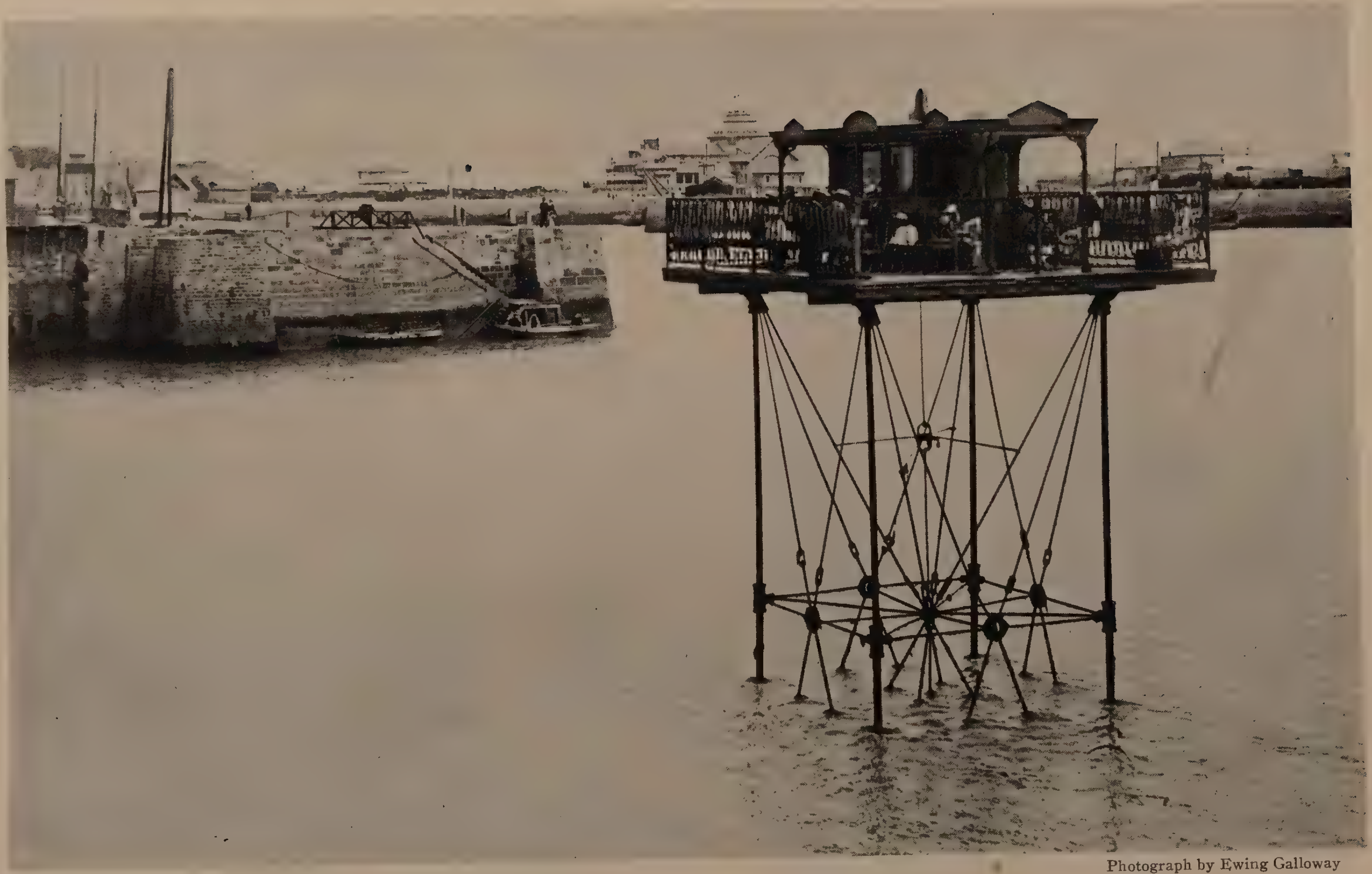
ST. MALO BAY: THROUGH THESE WATERS CARTIER SAILED TO CANADA

Stern and forbidding is the coastline of Brittany. The tide here rises more than 40 feet at certain seasons. For generations this region has been known as the "nursery of the French Navy."



AT LOW TIDE THE "FERRY" RESEMBLES A FEUDAL SCALING TOWER

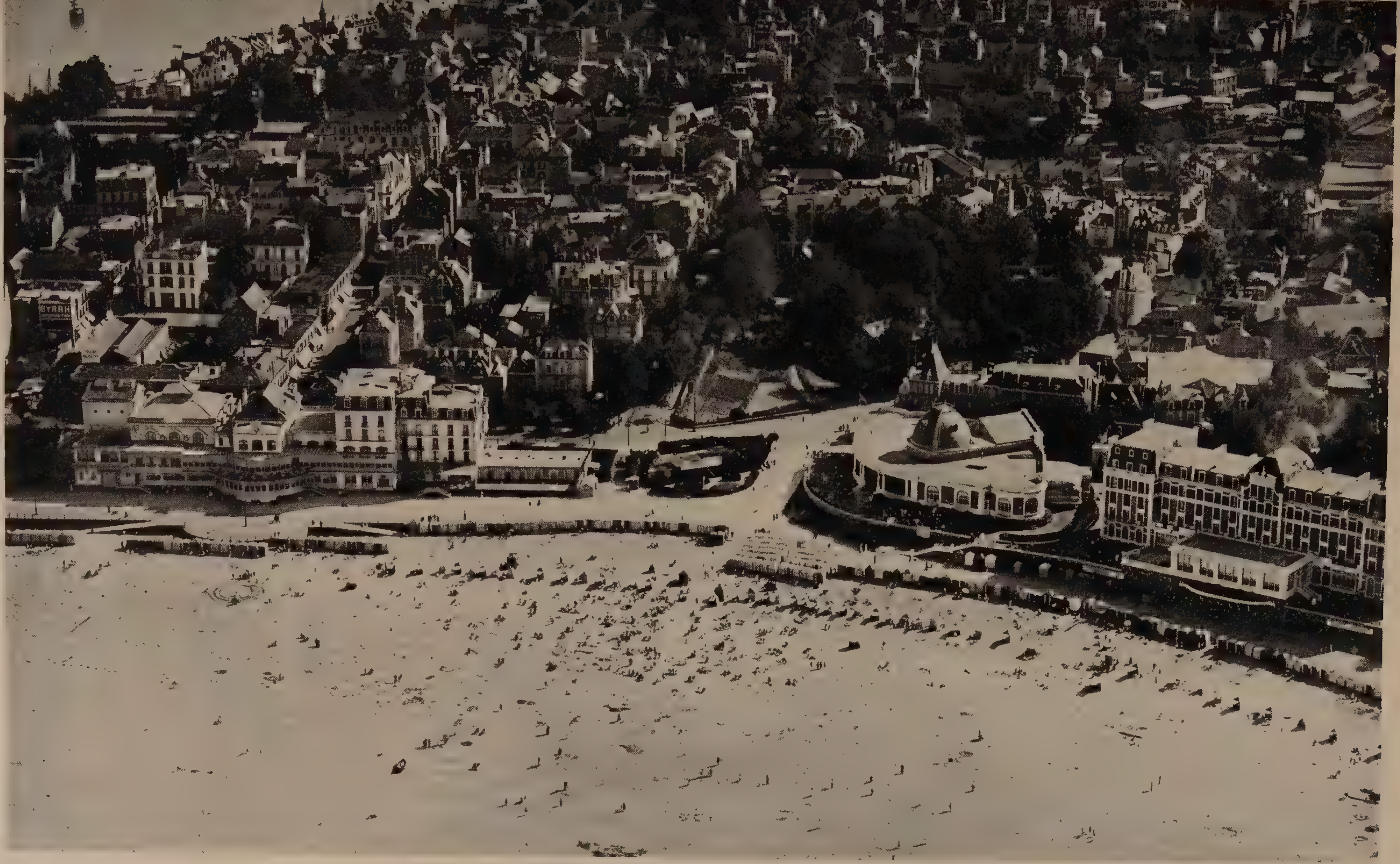
However, the passenger riding on this lofty platform to and from St. Servan feels safer when he can see the tracks than when he looks over the edge of the railed platform into 25 feet of churning water (see illustration, page 154).



Photograph by Ewing Galloway

THIS UNIQUE FERRY RUNS ON AN UNDERSEA TRACK

The derricklike structure connecting St. Malo and St. Servan, and known locally as the rolling bridge, is the invention of a Malouin engineer. When the tide is out, the rails and supporting truck are exposed, but at high tide they are 25 feet under water (see, also, illustration, page 153).



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DINARD IS THE FASHIONABLE WATERING PLACE OF BRITTANY

Although this modern seaside resort across the Rance from St. Malo (see, also, illustration, page 157) lacks the charm of antiquity that distinguishes the City of Corsairs, it attracts thousands of English vacationists. Because of its equable climate, it is popular even in winter. Its beach, bathhouses, small and large casinos, and one of its leading hotels are shown in this aërial view.

Photograph by John W. McFarlane

BRETON ART WORK AND COSTUMES ARE DISPLAYED IN THE CHÂTEAU

Anne of Brittany defied the clergy when she erected the great stronghold at St. Malo (see text, page 151). To-day the ancient building houses the city museum, a treasure house of priceless relics.

As the venturesome Malouins already were fishing on the Grand Banks, the handful of conquerors circled the whole Gulf of St. Lawrence. Cartier's report flattered the king, and soon the adventurer sailed with a larger expedition—the *Grande Hermine,* 120 tons; the *Petite Hermine,* 60 tons, and the *Émerillon,* 40 tons. He ascended the St. Lawrence; christened Mont Royal, where Montreal was founded in 1642; claimed all Canada for France, and abandoned the *Petite Hermine.* Weather-beaten fragments of the ship have been sent by Montreal to St. Malo's municipal museum. His third expedition was in 1541, 67 years before Champlain founded Quebec and more than 100 years before other French explorers and priests carried the Fleur-de-Lis down the Mississippi.

DUGUAY-TROUIN, FIRST OF THE GREAT ST. MALO CORSAIRS

St. Malo's only memento of Cartier, aside from the street signs, is a bronze statue erected in 1905 on the Bastion of Holland. In seafaring togs the explorer leans on a rudder and gazes across the waters toward that distant land which France could not keep.

Photograph by Junius B. Wood

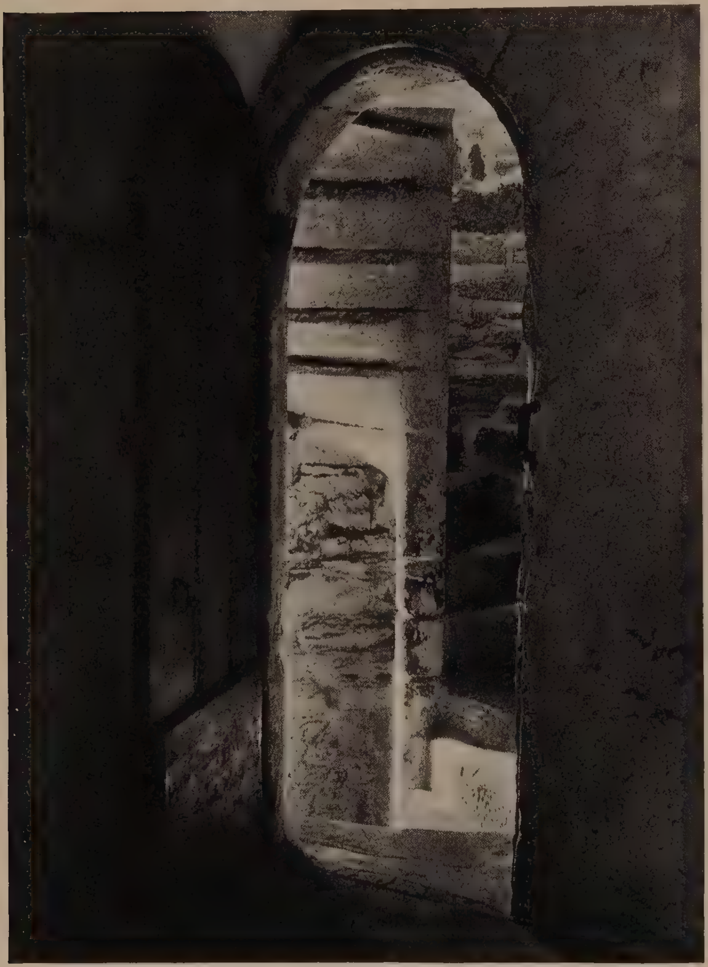
FOR FIVE AND A HALF CENTURIES THE SOLIDOR TOWER HAS GUARDED THE RANCE

Despite restorations, the grim stronghold built in 1382 by Duke Jean IV at St. Servan remains a good example of feudal architecture, with its three castellated and loopholed towers joined in triangular form. Its interior, noteworthy for chimney pieces and embrasures, was used as a prison in the Revolutionary and Napoleonic wars. From the small Port-St.-Père, at its foot, motor launches ply regularly to Dinard, across the river mouth at the left, and to La Vicomté (see, also, text, page 175).

The four-story frame house, with its eaves and trimming of slate, between the big windows of many little square frames, each floor projecting farther over the street than the one below, where René Duguay-Trouin was born, June 10, 1673, now shelters a curio store. Families still live in the upper stories and a sign commemorates the former tenant. The building is one of two so marked in St. Malo.

Duguay was educated for the church, but, like a true Malouin, answered the call of the sea. At 18 he was a captain of corsairs. The family came from the village of Gué, and in Breton style he added the title du Gué, which later became Dugué, and eventually Duguay. In 1709, after he had brought twenty warships and 300 merchantmen to France as privateering prizes, the king gave him a real title.

His most famous expedition, which returned 92 per cent profit to the St. Malo merchants who outfitted it, captured Rio de Janeiro on September 22, 1711. Part of that booty was the great bell, Noguette, which for nearly a century sounded the curfew from the clock tower of the Great Gate. The Revolution leveled the belfry for "love of equality," silenced the bell, broke St. Christopher's nose, and tossed the Sacred Virgin into the moat. The Virgin is again in her windowed shrine above the gate, looking up a little street



Photograph by John W. McFarlane

THE CHÂTEAU STAIRS RECALL DEEDS OF DERRING DO

In the days of Anne of Brittany these stone treads rang to the tramp of steel-clad warriors (see text, page 151). Now they serve merely to make visitors to the St. Malo Museum puff, for the defiant queen's stronghold has become a repository for relics (see, also, illustration, page 156).

to the cathedral spire on the hill where the bell, twice recast and rejuvenated, now hangs.

A square is named after the first of the corsairs. During the Commune a statue personifying Liberty, a hybrid of religious statues from nationalized shrines and altars, stood there. One of Duguay-Trouin took its place in 1822. Another change and the corsair gave place to a gray stone shaft in honor of *Les Enfants de St. Malo,* who fell in the World War. Duguay-Trouin's statue now stands across the street in front of the City Hall, buffeted as was its subject through life.

One of the strange old pictures in the municipal museum shows four village belles laughing at the bashful young René. Poor and alone, he died on September 27, 1736; but St. Malo has his name on street signs and one of the city's four statues is of him.

THE KING OF THE CORSAIRS

Loiterers on the ramparts on the Rance River side, near the Dinan Gate, where little steam launches bob across bay and river to dull and fashionable Dinard, occasionally look up to one of the high chimneys of the steep-roofed house on the corner and notice a little sundial of white marble. Local historians insist it is the handiwork of Robert Surcouf, France's uncrowned "King of the Corsairs."

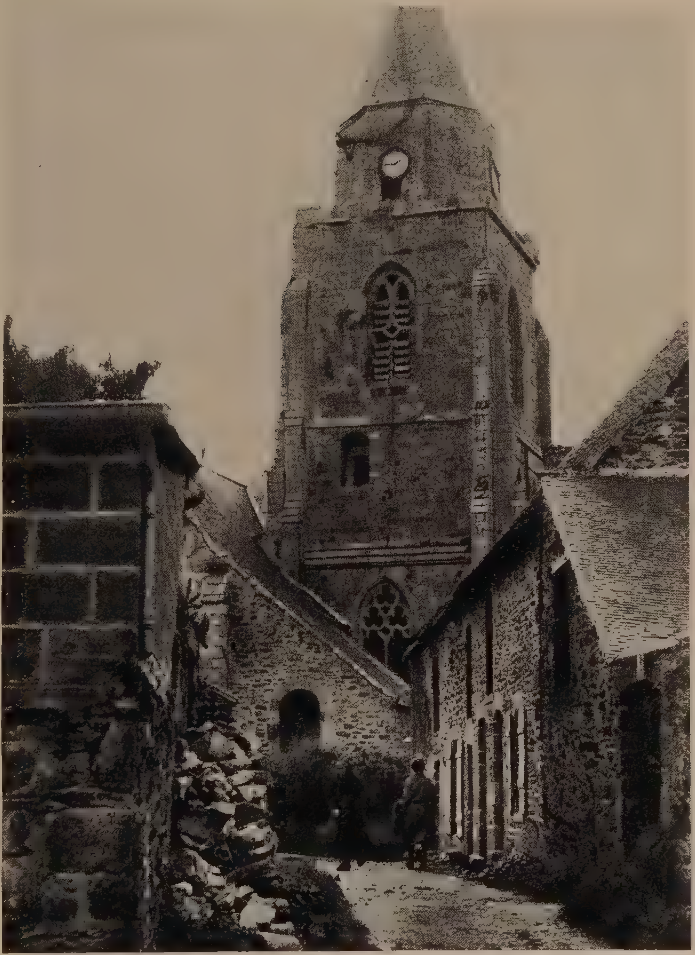
The great Surcouf (1773-1827), who has a namesake street in most of the cities of France, lived in this house, which now is a Norwegian consulate. He was a sailor at 13 and commanded a French warship at 22. He blocked the Ganges, his battles with the English men-of-war made history, and the number of frigates and merchantmen which his crews brought as prizes exceeded the spoils of all others during the years that St. Malo levied its broad-flung tribute over the seas. His bronze statue stands outside the Dinan Gate.

"Tell it to the monkey" is the strictly St. Malo retort of the strong-voiced ladies in the little round fish market when they argue over prices. The monkey, frozen into stone, has looked down on the market for 150 years.

The story goes that a captain who lived in the tall stone house, now a hotel, brought home a pet monkey in 1774. The sight of a woman across the narrow street rocking her baby in her arms was a daily marvel to its simian soul. But one day the woman was horrified to see the animal, perched on the high eaves-trough, giving an imitation of the lullaby with the captain's baby. Afraid that the monkey, if frightened, would drop its precious burden and run, the street kept silent. The resourceful mother, unversed in theories of evolution, but believing that monkeys are mimics, picked up her own baby, swung it back and forth, and laid it on the bed. The monkey coiled its tail around a rain pipe, slid down, and put its baby in the cradle.

The monkey's likeness was carved in stone and, like Lot's wife, remained on the spot. Until 100 years ago, Toussaint Thomas, an aged Malouin, was pointed out as the original baby to prove the tale. He and monkey now are gone and only the stone effigy remains.

Faded and dusty, some of the weird mementos of the days when Mediterranean pirates enslaved St. Malo corsairs and other captives remain in little Brittany churches to-day. When a slave escaped or worked his way to freedom, he would present to his village church a painted leather effigy of himself or of a lost comrade in Turkish costume.



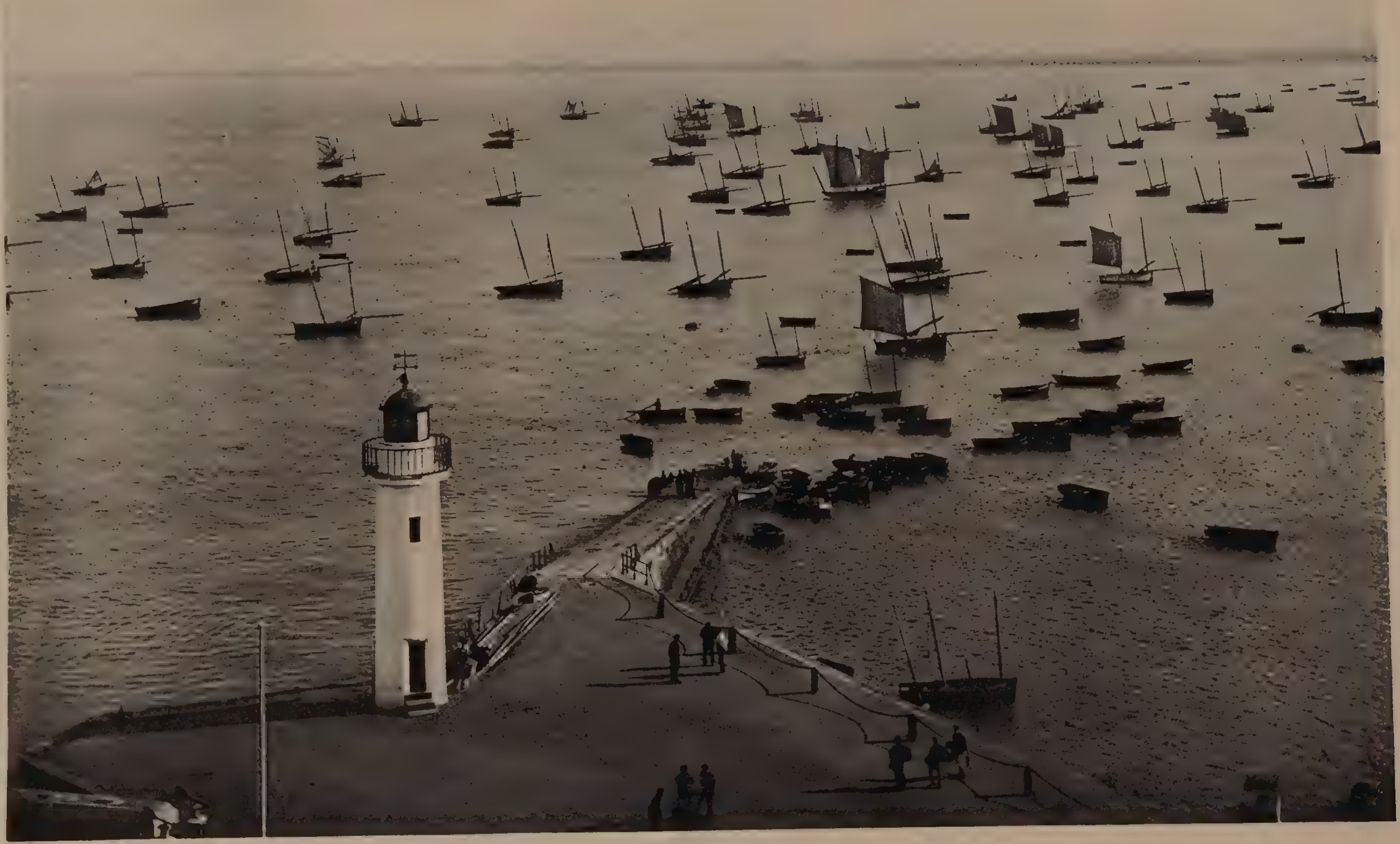
Photograph by Junius B. Wood

ST. SULIAC KEEPS GREEN THE MEMORY OF A WELSH MISSIONARY

In its 13th-century Gothic church this village near St. Malo preserves the tomb of St. Tysilio, who came from Wales to labor among the Bretons about A. D. 600. The holy man is said to have reversed the heads and tails of four donkeys to punish them for persistently swimming the Rance and browsing in his garden; and a stained-glass window depicts the animals thus miraculously deformed.

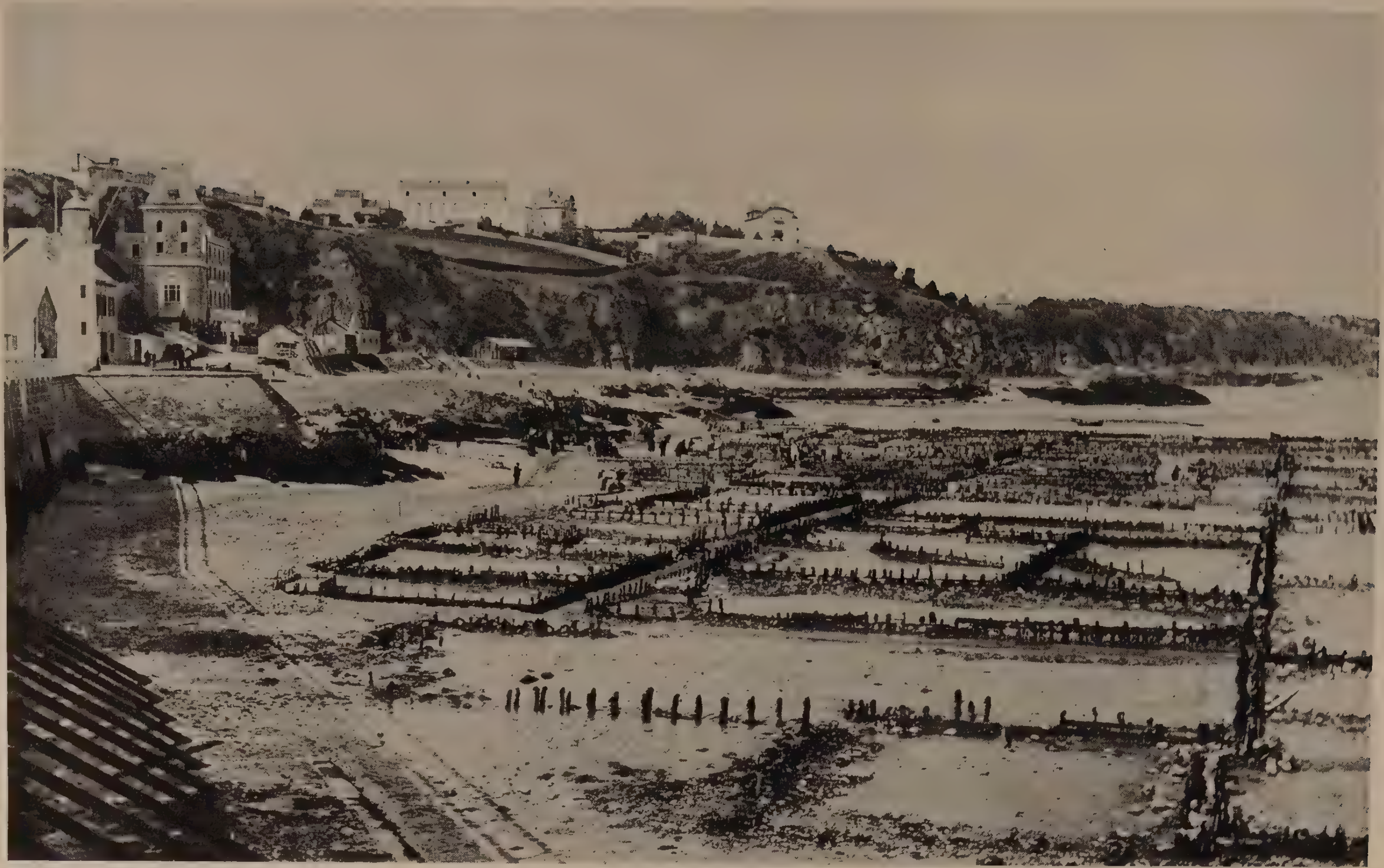
The Malouin especially berated the English, and the king's English did not have enough adjectives to express what the English thought of him. St. Malo chronicles enumerate the city's liberality to English prisoners, and English narrators emphasize their leniency to these "robbers" (other names deleted) of the seas.

A favorite St. Malo anecdote is of a Malouin prisoner tied to an English mast



OYSTERMEN PLY THEIR CRAFT NEAR CANCALE PIER

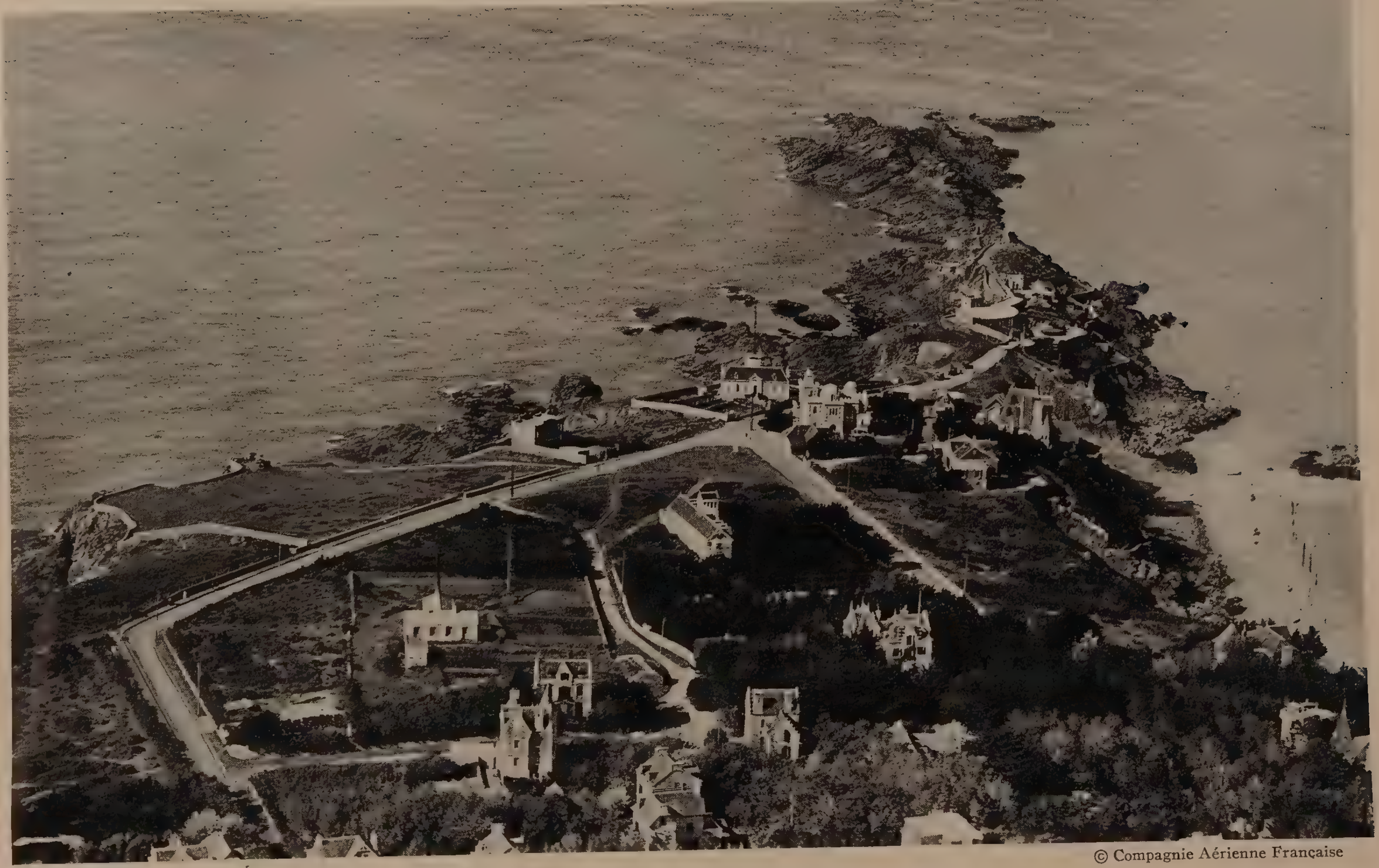
Bivalves nourished in special breeding grounds near by (see illustration, opposite page, and text, page 175) are the main source of revenue at this busy place north of St. Malo. At low tide the beds are exposed. La Houle, the fishing village, is built on the quay. The old town, Cancale-Ville, stands on the cliffs above.



Photograph by Topical Press Agency

CANCALE MAINTAINS OYSTER BREEDING GROUNDS

At the yearly *Caravane* in April the beds from which the fisherfolk of this Breton port derive their livelihood are replenished. The town is famous for its seafood and for the pretty headdresses worn by the women.



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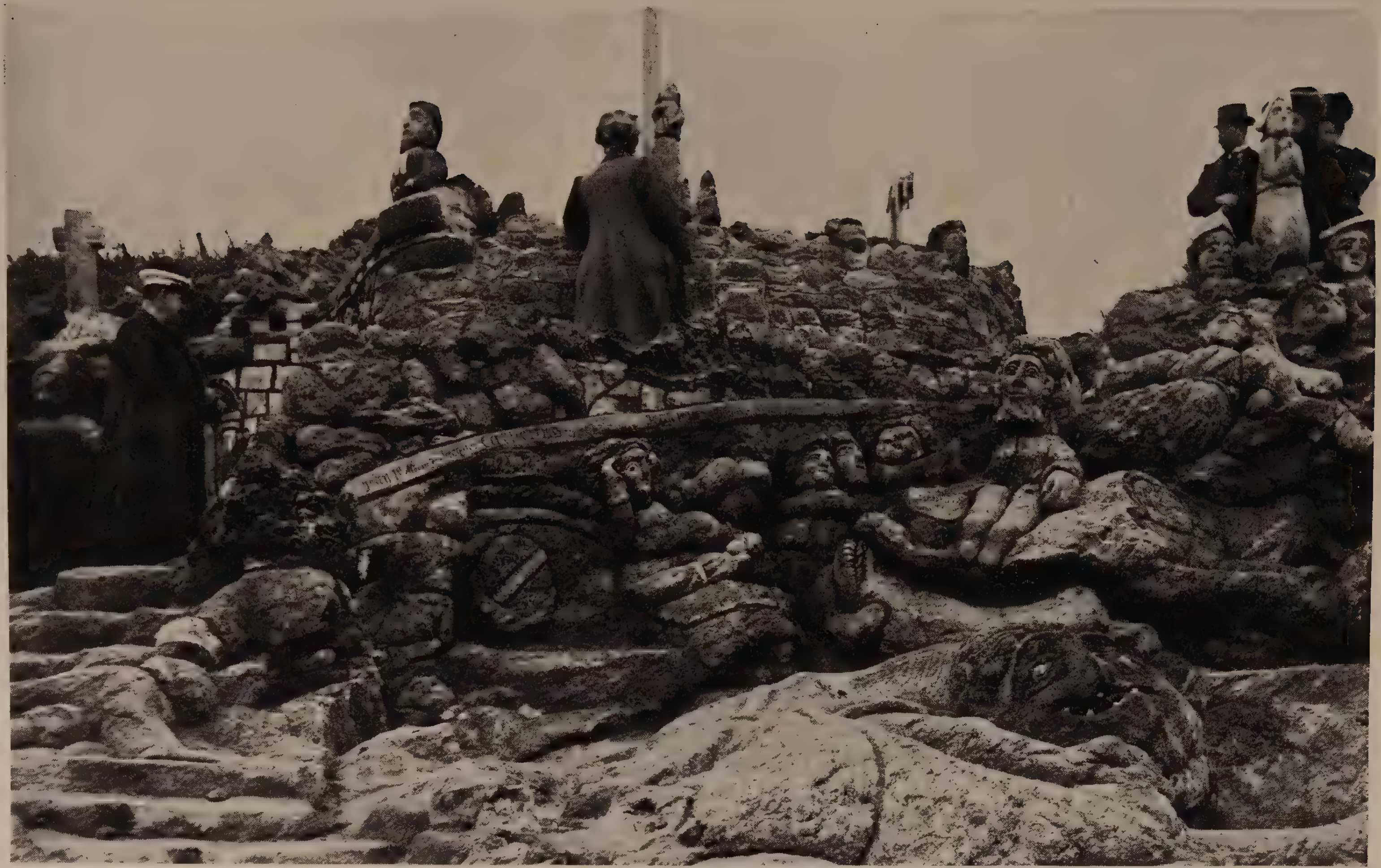
ST. LUNAIRE HAS THE ONLY GOLF COURSE IN BRITTANY

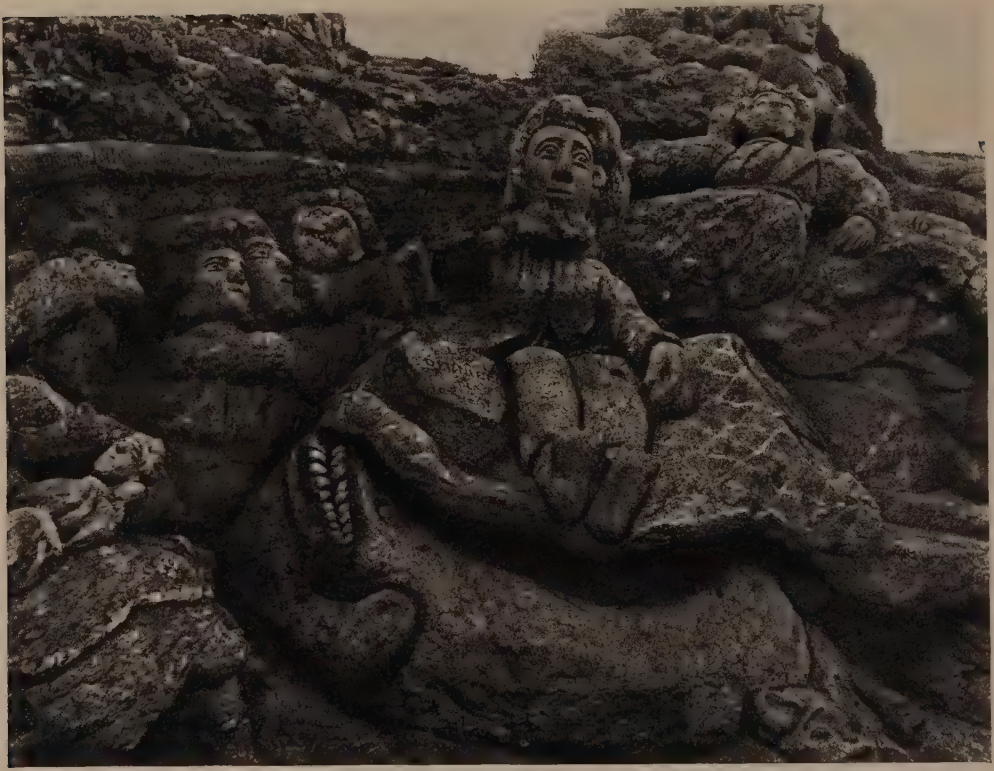
This little city on the Pointe du Décollé, between two sandy-beached bays, has much to attract the tourist. Splendid villas are being built on the characteristic spit of land that thrusts its rugged promontory out into the harbor. The old town, some distance inland, has a disused 11-16th century church with the tomb of St. Leonorius, a Welshman said to be the nephew of St. Briocus.



Photograph by Louis A. J. Barbé

FIGURES BY THE ROTHÉNEUF SCULPTOR COVER A WHOLE CLIFF NEAR ST. MALO

Saints in uncomfortable poses, snakes, animals, and domestic scenes mingle indiscriminately in this extensive display (see, also, illustrations, pages 164 and 165). Abbé Fouré, the artist, died in 1910, and water and weather have already destroyed part of his work and damaged the rest. This photograph was taken some years ago, while most of the sculpture was still intact.



Photograph by Louis A. J. Barbé

SEEN CLOSE UP, THESE FIGURES SHOW AMAZING DETAIL

The Hermit of Rothéneuf was not a master sculptor, but his indefatigable patience is proved by the quantity and intricacy of his work (see, also, illustrations, pages 163 and 165). Besides the rock carvings on the cliff, he made many smaller pieces. The latter, which are mostly of wood, are on display in his house and garden near by.

and slowly succumbing to the jabs of arrows, knives, hot irons, and other implements of a festive crew.

"You fight for gold; we fight for honor," the captain mocked him.

"Then, sir, each fights for what he does not have," the prisoner replied.

"ROBBERS OF SEA AND KING"

In the interests of international amity, St. Malo was forbidden by France to trade with the Spanish colonies. Cádiz hired St. Malo skippers for its ships, just as the French king selected the admiral of his navy from St. Malo (its hydrographic school, founded by Colbert in 1660, now claims to be the oldest in the world); but the great wealth of the St. Malo outfitters came from privateering and clandestine expeditions. Ships cleared under one name for the Canaries and returned in two or three years, under a different name, laden with the products of Asia, Africa, and the Americas. Local port officials never noticed the many tricks and, according to their reports to the royal court, the St. Malo merchants and corsairs were always right.

While other nations called St. Malo's corsairs "robbers of the sea," the royal court in Paris knew them as "robbers of the king." The most precious treasures of their returning cargoes were smuggled into cellars and granaries before the Paris appraisers arrived.

St. Malo threatened to become a republic rather than pay taxes. When Colbert asked its bishop to collect 30,000,000 livres from his wealthy vassals as a loan to the bare treasury of Louis XIV, the bishop sarcastically refused. By threatening to blockade the port, Colbert collected the tribute, which the merchants knew would never be repaid. However, in 1711, St.

Photograph by Junius B. Wood

ABBÉ FOURÉ DEVOTED A LIFETIME CARVING THE ROCKS AT ROTHÉNEUF

In this outdoor gallery is found a collection of some of the quaintest sculptured figures in the world, the work of a priest who probably learned his art from the grotesque ossuaries of Breton churchyards (see, also, illustrations, pages 163 and 164).

Malo offered to furnish six fighting ships to the French navy to drive the English from the coast of Peru. The city's clandestine commerce was in danger.

THE "CHAPLAIN OF THE CORSAIRS" COMBINED RELIGION AND TRADE

On the corner of Rue St. François is a plain stone house with "1648" chiseled over its door. Here lived Noël Jouin, better known as l'Abbé Jouin, "Chaplain of the Corsairs." Guidebooks are silent on this famous son of St. Malo, but Etienne Dupont, scrupulous historian that he is, gives a volume, "L'Aumônier des Corsaires," to one who was either the most meteoric rogue or the unluckiest merchant of his age.

The abbé combined religion and trade. Born the son of a ship carpenter, at ten he stood first in his parochial classes. He became assistant chaplain on a corsair expedition, and after that the salt of the sea was sweeter to his nostrils than the incense of the altar.

Law required that each crew of 40 men or more have a chaplain. The pious Breton sailors also insisted on one. The chaplain often doubled as supercargo and even joined in the fighting. He was allowed to trade on his own like other sailors, but his rations and quarters were of the worst.

Abbé Jouin bargained and saved on three voyages and knew the American coast and the resources of its cities as well as any veteran corsair. His own most famous expedition—the ships *La Confiance* and *Le Brilhac,* each of 300 tons and

32 cannon and with crews of 100 and 120 men respectively—sailed from St. Malo on January 23, 1706. After 39 months of illicit trading, from Mexico to Chile, The *Confiance* was back in Port Louis, Brittany. The *Brilhac,* with most of the profits, was home earlier, before the storm broke.

The *Confiance* was one of the seven French corsairs which two French men-of-war convoyed home from Concepción. On the escapade of this famous fleet is based the fable that St. Malo merchants once loaned 30,000,000 livres to Louis XIV. Advance reports from Chile and Martinique fixed that as the value of the cargo, and Versailles celebrated on the strength of the taxes anticipated for its depleted treasury. Probably the 30,000,000 livres' valuation of the cargo was nearer correct than the tenth of that amount which the owners insisted on when Count Pontchartrain started to collect.

The royal treasurer's wrath became furious when he discovered that the crafty Abbé Jouin, either by blandishments or bribes, had convinced the captain of the frigates that the *Brilhac* could carry the royal dispatches home quicker than the slow convoy. His most valuable cargo had been transferred secretly to that ship, carried to France, and safely hidden away.

On April 10, 1709, two weeks after the arrival of the fleet, Abbé Jouin was in the safest cell in Port Louis; the King's own guards had gone to Rennes to take him from the admiring Malouins.

THE CHAPLAIN CONSOLES THE LOVELORN

Prison or monastery cell did not disconcert Abbé Jouin, who figured his accounts, planned for the future, and gently sympathized with the aged commandant of the fortress-prison, who was dreaming of marriage and a country château, but lacked fortune or pension. In an "unguarded" moment the abbé confided to the commandant that the *Brilhac's* strong box, which was being held for him, was filled with treasure destined as a dowry for his sister. The officer's aged heart fluttered with tender sentiment, and since he could not marry the ward of a prisoner, he interceded with the King, and Abbé Jouin was released.

Abbé Jouin, no longer interested in love, was back in business. The disconsolate commandant got more laughs than sympathy. A perplexed and angry Pontchartrain, realizing that instead of revenue he had a jilted spinster (the abbe's sister) on his hands, induced Louis XIV to find a place for her in a convent. Some historians say she never existed.

In 1711 Louis appointed Abbé Jouin private chaplain for his brother's wife, "Madame" Charlotte Elizabeth d'Orléans, "Liselotte," mother of the future regent of France and one of the most prolific and unabashed letter writers history has ever seen. "La Madame" approved of her chaplain, as the shrewd king expected, because his chapel services were never more than 10 minutes long. "To me it's opium," was her characterization of religion.

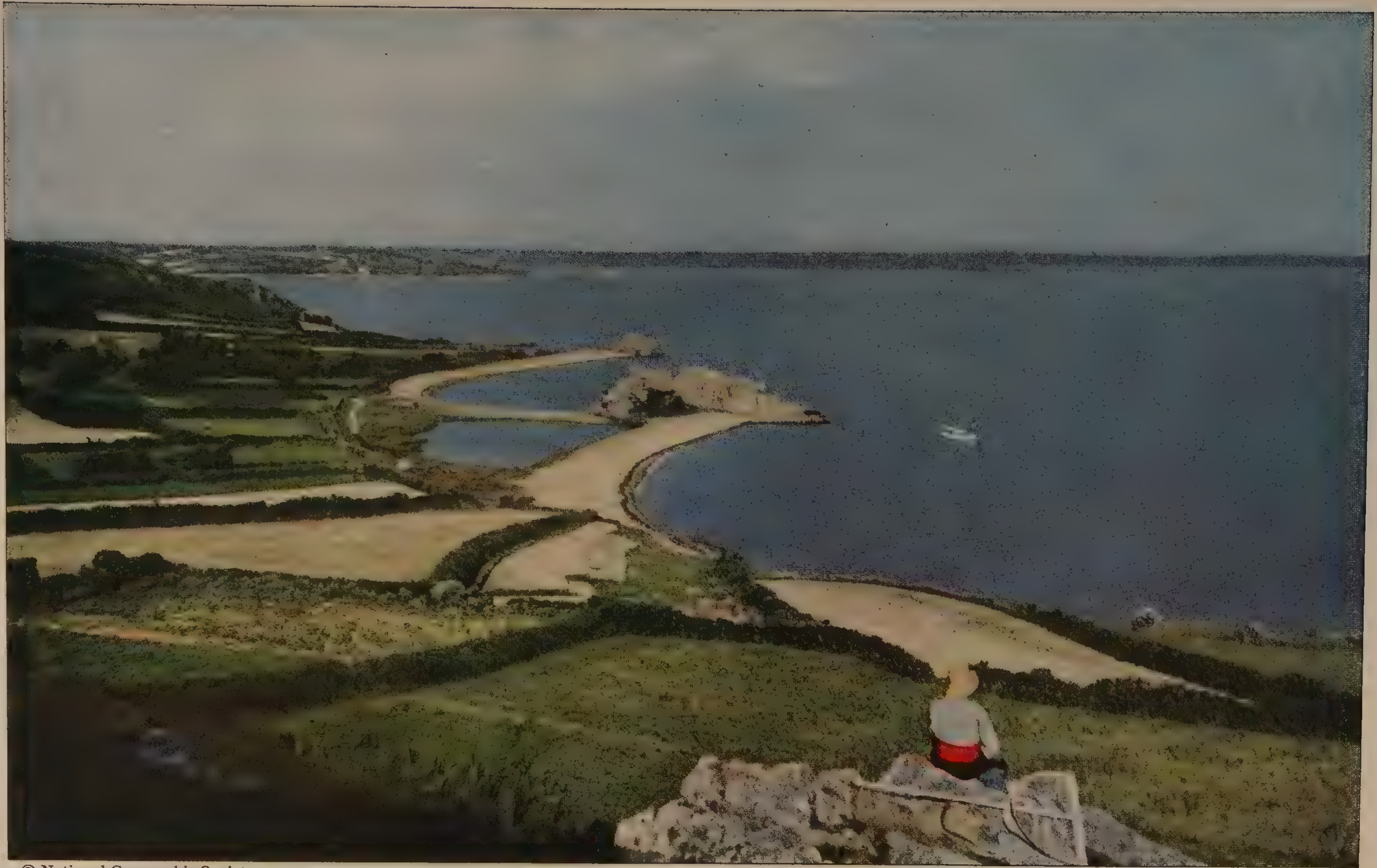
When, in 1713, a court ordered the *Brilhac's* strong box opened, several hefty stones were found inside. A local geologist declared they had never voyaged farther than from the Hennebont quarry. Abbé Jouin, who then was high in the grace of royalty, indignantly protested that his treasure had been stolen and the stones substituted while he was in prison.

A MALOUIN GIBE

The next year Abbé Jouin lost his entire fortune in a single luckless venture. He is last heard of petitioning the King of Spain to send him to convert the Indians of Patagonia.

Visitors to the Château to-day are shown several old solid shot in the walls and told that they are from the first English bombardment. No shot could imbed itself in those walls, and, what is more, the walls were not built at that early date. In 1378 the Duke of Lancaster, with 4,000 soldiers, 8,000 archers, and 400 cannon, led the first of the futile English bombardments of the Corsair City. St. Malo had declared its independence of English rule, which then was over most of Brittany.

In 1439 they tried again and in 1692 were back with a Dutch fleet, while in 1693 an imposing English fleet settled down for a three-day attack, ending with the explosion of the famous floating mine



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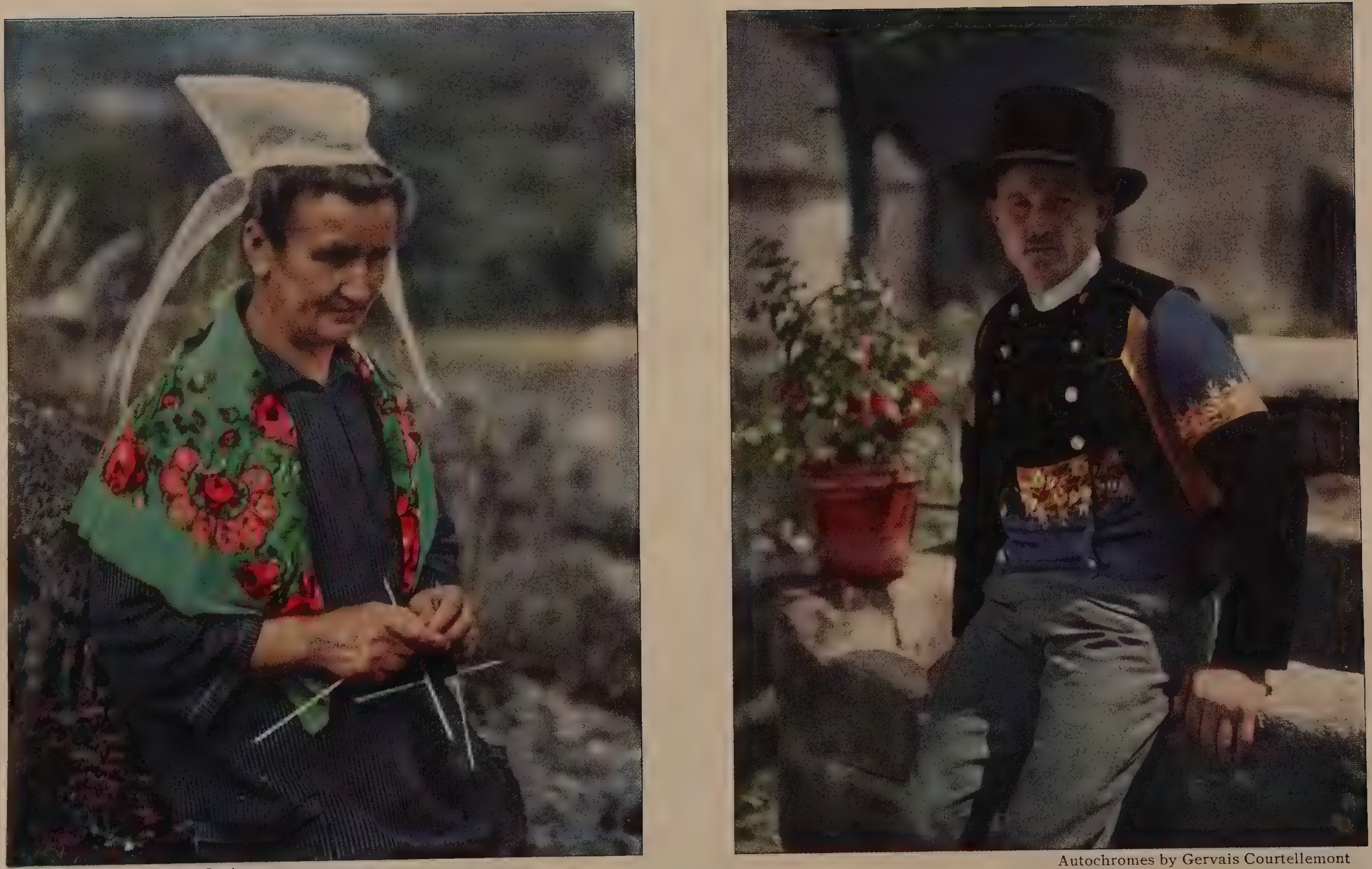
Autochrome by Gervais Courtellemont

BRITTANY, LIKE IRELAND, HAS ITS EMERALD ISLES AND WINDING BAYS

At Arcouest Point, opposite the fortified Ile de Bréhat, the sinuous coastline, bordered by hedged fields smiling in the glow of a clear morning, reminds the traveler of the shores of Killarney. Breton and Irish folk, as well as their countries, have much in common.



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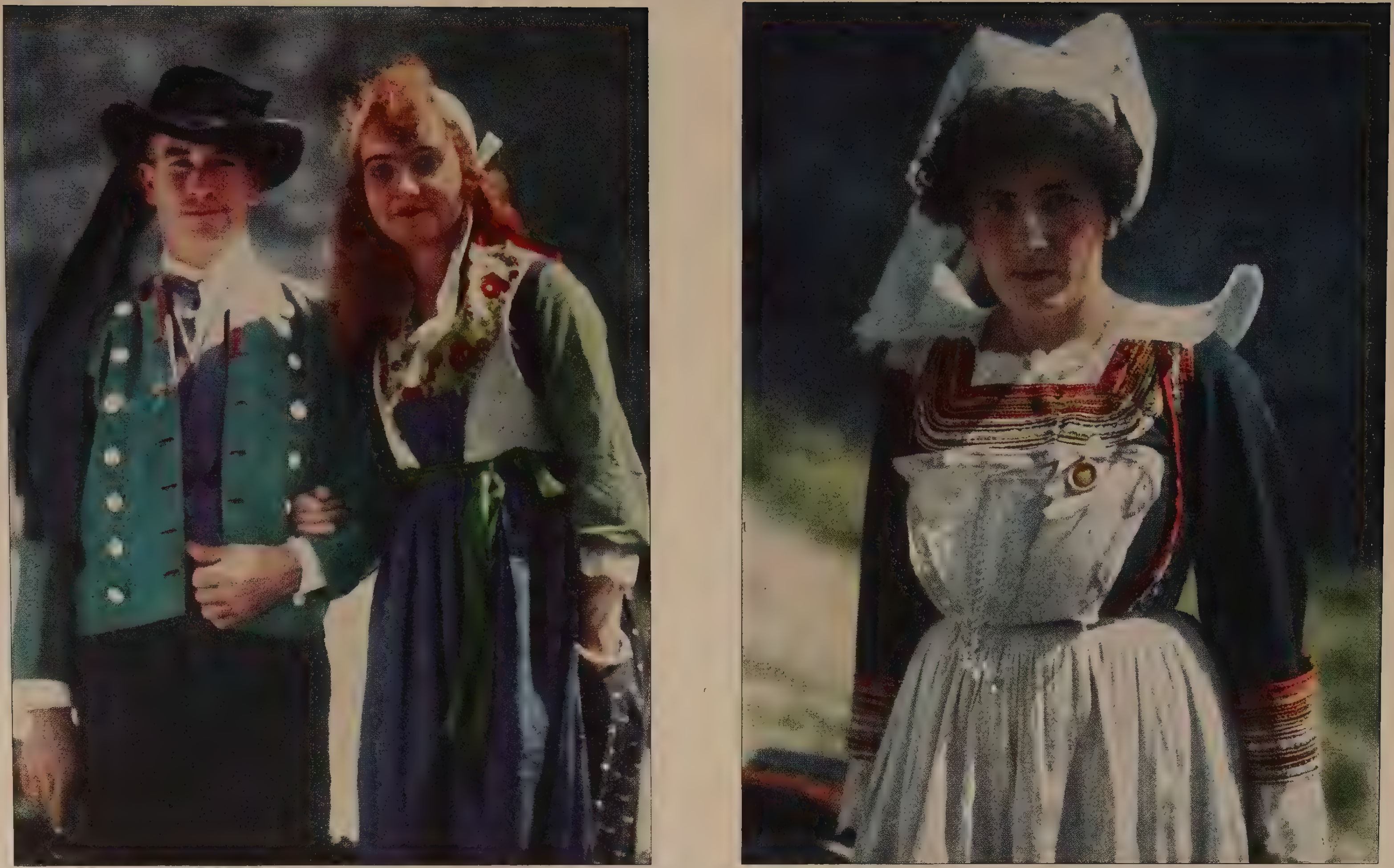
BRETONS OF BOTH SEXES ARE FAMOUS NEEDLEWORKERS: THE MEN EMBROIDER THEIR OWN JACKETS

With handsome hand-decorated shawl about her shoulders, the woman guardian of the Tour de Kerroch, north of Paimpol, whiles away the hours of service with knitting. The young gallant is arrayed in fancy Cornouaille costume for the Pardon at Plogonnec.



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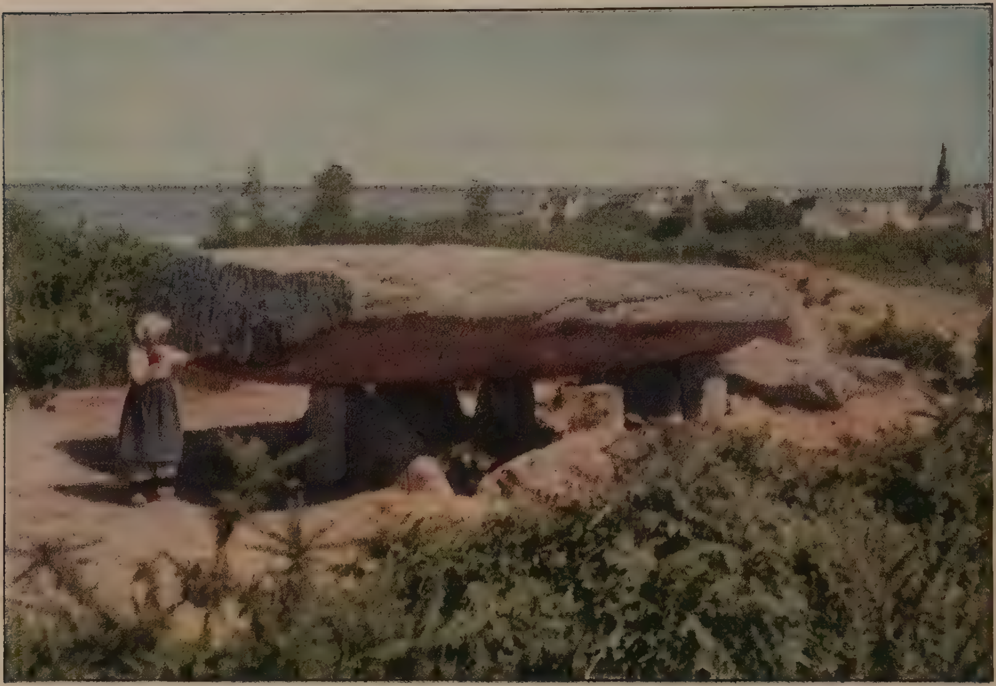
TRADITIONAL COSTUMES APPEAR AT ALL CELEBRATIONS IN BRITTANY

This good-looking couple of Plougastel are on their way to church. Sundays and days of weddings or religious fêtes afford opportunity for folk of the village to don fancy apparel. The young woman at the right has taken an award at the Blue Nets Feast of Concarneau with her Pont-Aven dress.



LOCMARIAQUER DOLMENS ARE REMARKABLE FOR SIZE

The ancient Table des Marchands is supported, at the end near which the peasant woman stands, by a conical inscribed menhir. Relics here are fewer but much larger than those at Carnac (see Color Plate XIII).

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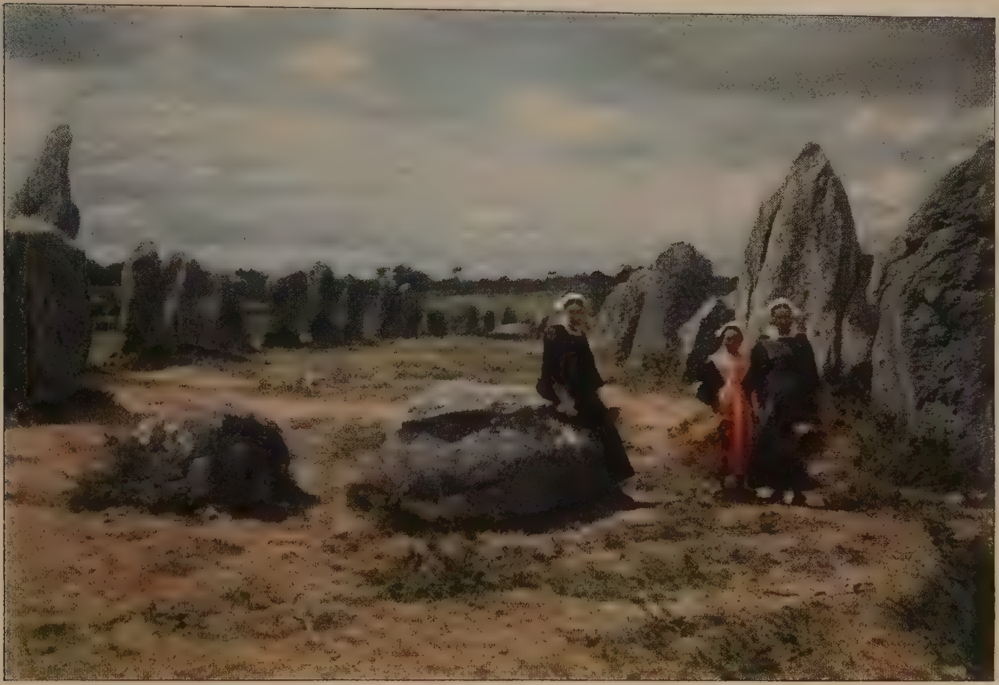
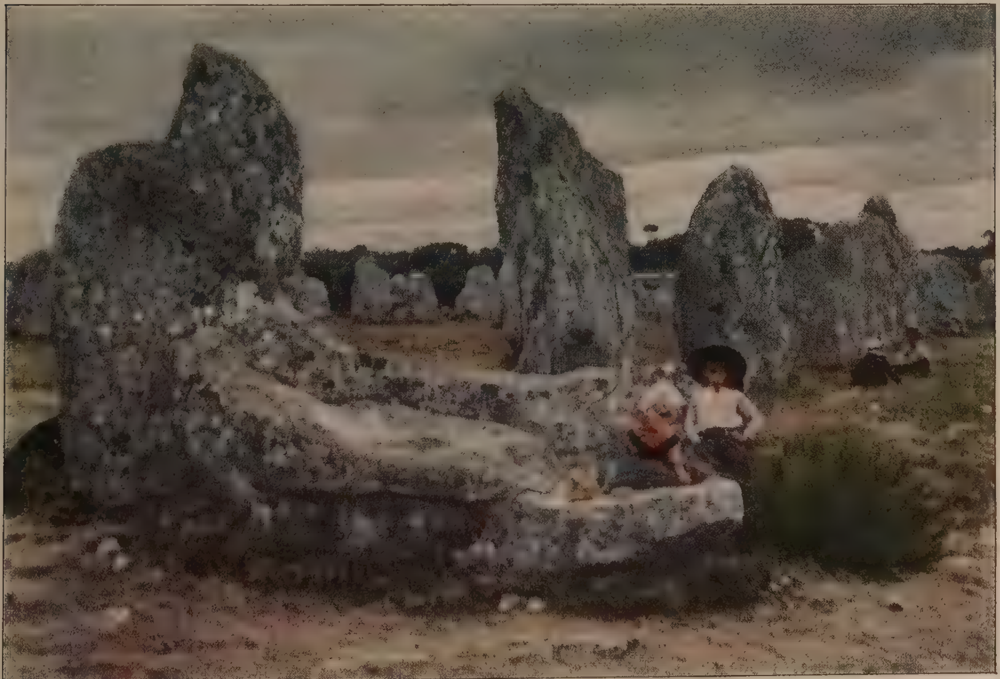
HEDGEROWS SEPARATE LOCRONAN FIELDS

Dear to the Celtic heart is this Breton country landscape near the spot on which the Irish missionary Saint Ronan built his forest hermitage in the 5th century. At the "Tour of the Monastery," celebrated in the village in mid-July of every seventh year, thousands of pilgrims in procession make the circuit of the wood where he dwelt.



THE ALIGNMENTS OF CARNAC COMPRISE 2,813 MENHIRS

Modern scholars recognize the probable funerary character of these lichen-covered megaliths, but the Auray women accept the local tradition that they are pagan hordes miraculously turned to stone while pursuing Saint Cornelius to the shore.



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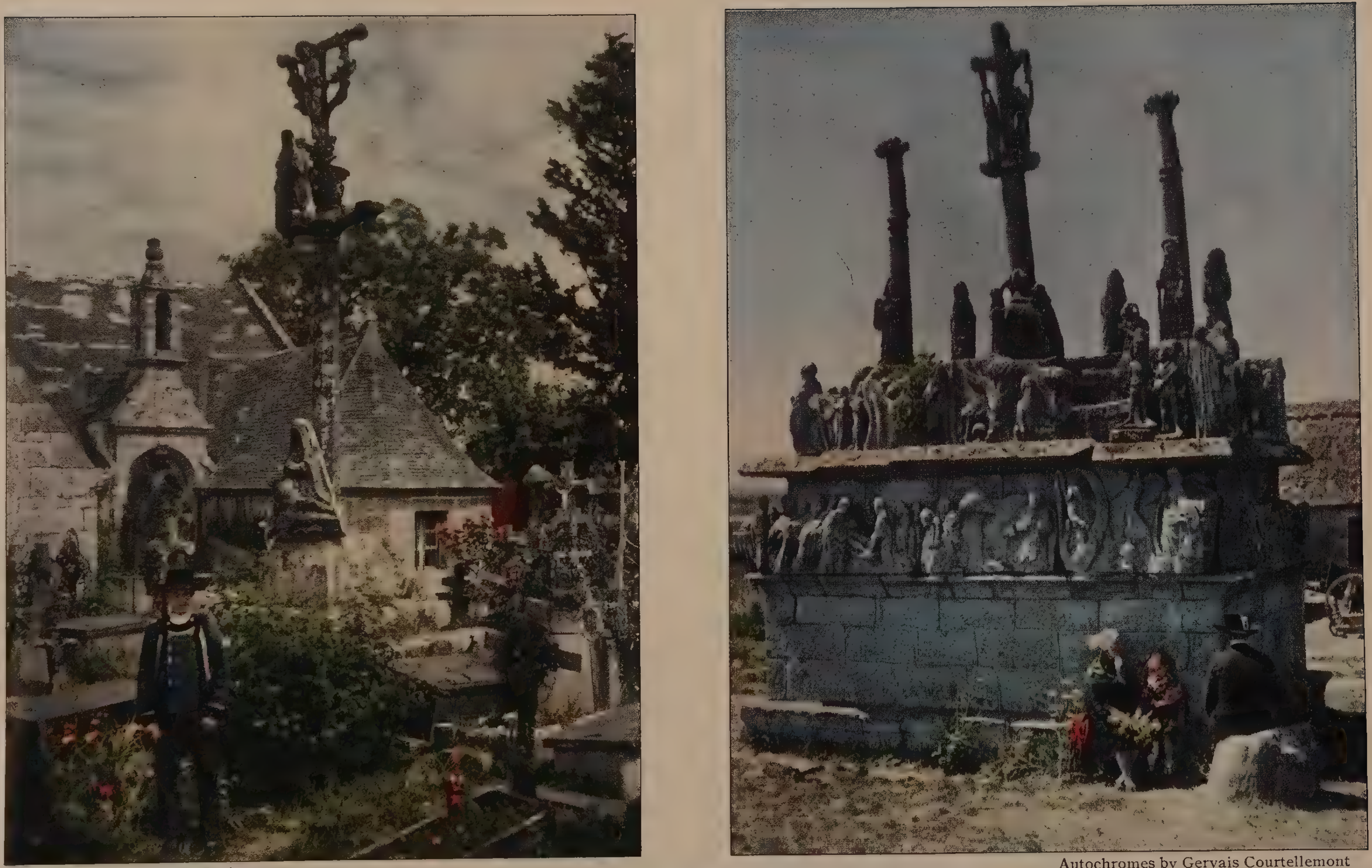
Autochromes by Gervais Courtellemont

"THE ROCK OF SACRIFICE" AT CARNAC

Eighteenth-century students dismissed this altarlike megalith and the other stones in the lengthy avenue at Carnac as mere windbreaks erected by Roman legions to shelter their tents. Modern authorities know them for monuments of a forgotten people (see "The Mysterious Prehistoric Monuments of Brittany" in the National Geographic Magazine for July, 1923).



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MUCH OF THE CHARM OF BRITTANY IS IN ITS PLACES OF WORSHIP

The venerable man at the left pauses for a moment among the graves after attending services in the ancient church at Ploéven. The Calvary of Notre Dame de Tronoen, at the right, is the oldest in the province. Such structures are to be found throughout the country, not only near chapels but by waysides and at crossroads.

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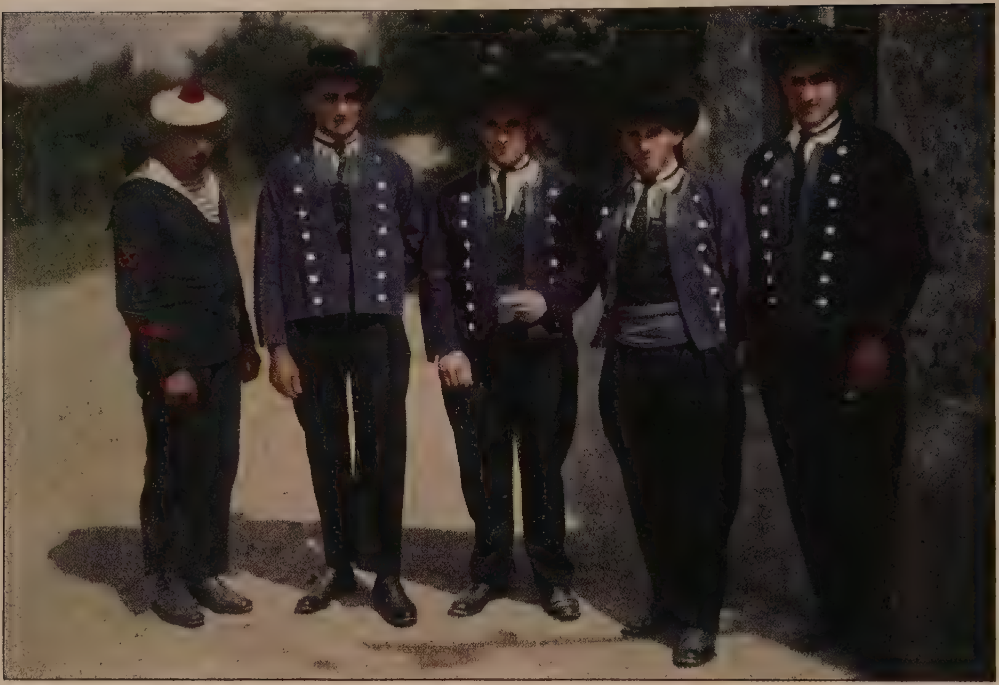
Autochrome by Gervais Courtellemont

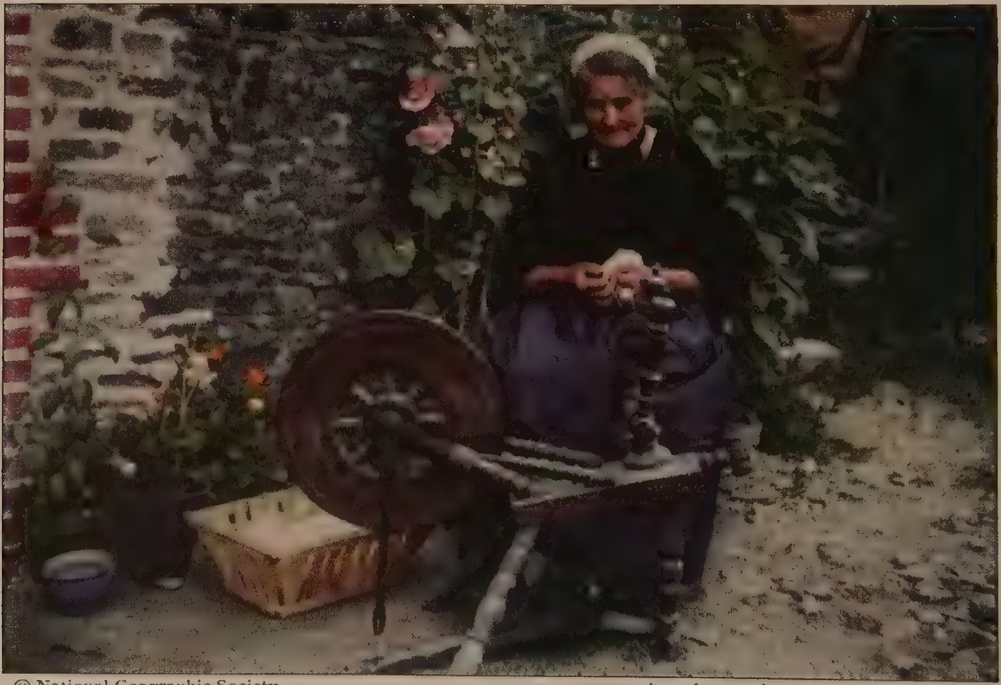
LEGEND SAYS THE CITY OF YS LIES BENEATH THESE WATERS

An ancient Celtic poem tells a story of King Gradlon, whose wicked daughter, Dahut, stole from his neck, as he slept, a golden key and, to please a lover, unlocked the gates of the dikes. The monarch awoke, leaped on his horse, and, putting the girl on his saddle, fled. But the voice of God commanded him to cast her to the mercy of the flood to expiate her sin. The Breton fisherfolk tell of hearing the bells of the submerged churches ringing wildly when storms are raging over Douarnenez Bay (see also Color Plate V). Lalo's opera "Le Roi d'Ys," is based on this tale.



A SAILOR FROM BREST VISITS AT PLOUGASTEL

Even the sprightly navy uniform cannot dim the glamour of the traditional hats and jackets worn by the villagers when the Pardon is celebrated.



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OLD CUSTOMS LINGER IN THE MONTS D'ARRÉE NEIGHBORHOOD

Beside her flower-bordered cottage this farmer's wife spins wool on an ancient Breton wheel. She makes homespun to clothe the family.

on the evening of November 29. The tide had saved St. Malo, and the ship was aground. The blast broke all the windows and spoiled the Sunday suppers, but did not damage the ramparts. The city sent a characteristic war communiqué to the departing fleet, saying that only five shots had fallen in the city in three days, but that the noise of the infernal machine killed a cat with a weak heart!

In 1695 another Anglo-Dutch fleet of 70 ships battered the walls for four days. In June, 1758, Admiral Howe besieged the city for eight days, burned all the ships on the beach, and destroyed the convent and partly completed fort on the island of Cézembre. In September, reënforced with an army, he made another attempt. It ended 380 years of fighting to subdue St. Malo.

During the Boer War a sailor, imbued with ancient enmities and modern *vin rouge,* ran up a Boer flag. He was arrested. It was the last hostility.

THE WORLD'S GREATEST BUILDER OF FORTS

As the world's greatest builder of forts, Vauban must have felt his heart flutter when he stood on the watchtower of the Great Dungeon in 1689 and gazed over St. Malo, over its little rocky islands scattered offshore, and the projecting crags of the Breton coast. Throughout the centuries the local citizenry had built well, but the master engineer saw a dozen more building sites. He also extended the ramparts and planned the present port works of granite, which were to be completed in four years and to cost 4,500,000 francs, but which were finished in 150 years at a hundred times the estimate.

Vauban's great pupil, Garangeau, finished the last of the forts which the master planned. Three or four have been modernized and still bravely repulse photographers and wandering strangers whose unacademic French may brand them as "getting military information for an enemy power." Most of them are picturesque ruins, their garrisons limited to the Madelons serving drinks to perspiring tourists.

Jean IV, Duke of Brittany, did not tread on the toes of the belligerent Josselin de Rohan, bishop of St. Malo, when he put up Solidor Tower at St. Servan in 1382. Jean VI had worked up more courage 42 years later, when he started the Great Dungeon, almost on the walls of St. Malo. Solidor, three round towers welded together under one peaked roof (see illustration, page 157), across a little bay, but on the same side of the Rance River as St. Malo, was a defy, but more to collect tribute on the river boats.

Visitors who walk along the inner harbor to the twin city of St. Servan to-day climb the 104 steps to the top of Solidor and look for miles up a quiet tidal river which once carried commerce of France. The long, straight road connecting the two cities gives the wandering American a proud surprise with its signs, each reading: "Wilson Avenue" and, in smaller type, "Benefactor of Humanity, 1914-8."

Hikers on the high dike promenade pass the Épi de la Hoguette, where lovers and overheated losers from the near-by casino of Paramé cool and meditate on the little cluster of rocks which for years supported one of St. Malo's many scaffolds. The last ecclesiastic hanging on this group, now Fort National, was in 1685; the French Revolution's guillotine, reached by the "red stairway," was near the Dinan Gate in 1790; but the hangings, beheadings, shootings, drownings, and tossings over the ramparts which once were imposed by law have ceased to be open-air attractions.

A mile farther, past Fort Rochebonne, a private villa, is the Tower of Happiness, gift of a French citizen, near the abandoned Fort de la Varde. On clear days, from the tower, the island of Jersey and Cape Fréhel can be seen, immemorable boundaries to St. Malo's visible horizon. A sign on the low bench says: "Whoever sits on this bench for ten minutes will be happily married within a year. Dream! Meditate! Wish!"

AN OUTDOOR ART GALLERY

Rothéneuf, with its neglected and forgotten harbor and its weirdly carved cliff (see illustrations, pages 163, 164, and 165)), sleeps beyond.

Several miles farther across the little peninsula is Cancale, reached from St. Malo by a steam train which cruises through the main streets of all villages, leaving a broader trail of smoke than an

Photograph by John W. McFarlane

HIGH TIDE OR LOW, THE SEA IS THE MALOUIN'S LIVELIHOOD

When the water recedes from the harbor, leaving little pools among the rocks, many enterprising hucksters are busy catching snails, shrimps, and crabs to sell in St. Malo streets.

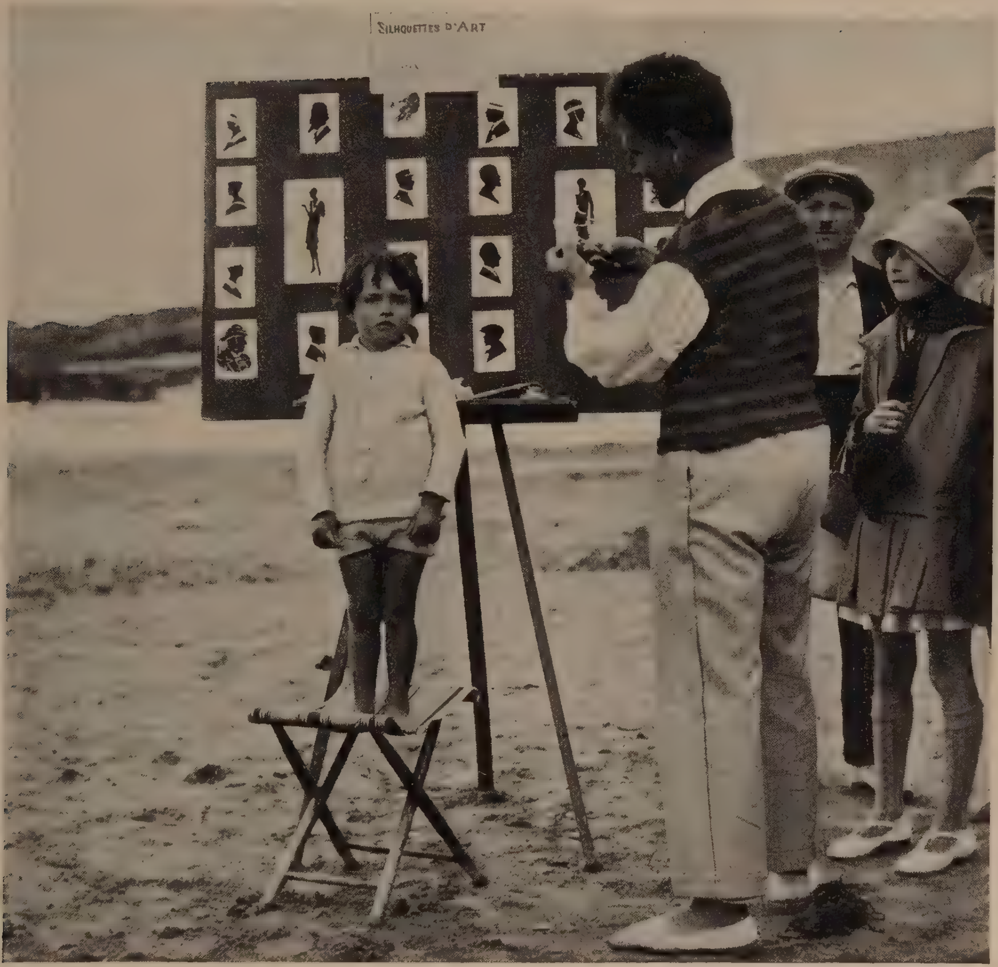
ocean liner and compelling passengers to shut themselves in with the age-old odors of fish, market baskets, and barnyard boots. Cancale claims fame from its oysters, but the oysters come from the nearby port, La Houle, and only the unknown hero who ate the first oyster could consider them famous.

La Houle, a row of tall houses on a single street, nestling between cliff and bay, shows the fenced-off squares of mud at low tide, where each family is said to have its herd of oysters.

According to rule, each year, on a day fixed by the Government, all the Cancale or La Houle oyster herders sail out to where the oysters are running wild. Each scoops up a boatload of bivalves, which he brings in and puts to bed in his private pasture, to be fed and fattened for exactly two years, and then eaten by city purchasers (see pages 160-161).

CHANGELESS THROUGH THE CENTURIES

Those who bargained and tricked in old St. Malo are gone, but what they built stands through the ages, as changeless as tides or setting sun. A high-wheeled cart, with a fat horse in the shafts, creaks off the beach with a load of the dripping seaweed which fertilizes the rocky Breton fields with iodine, soda, and lime. School



Photograph by John W. McFarlane

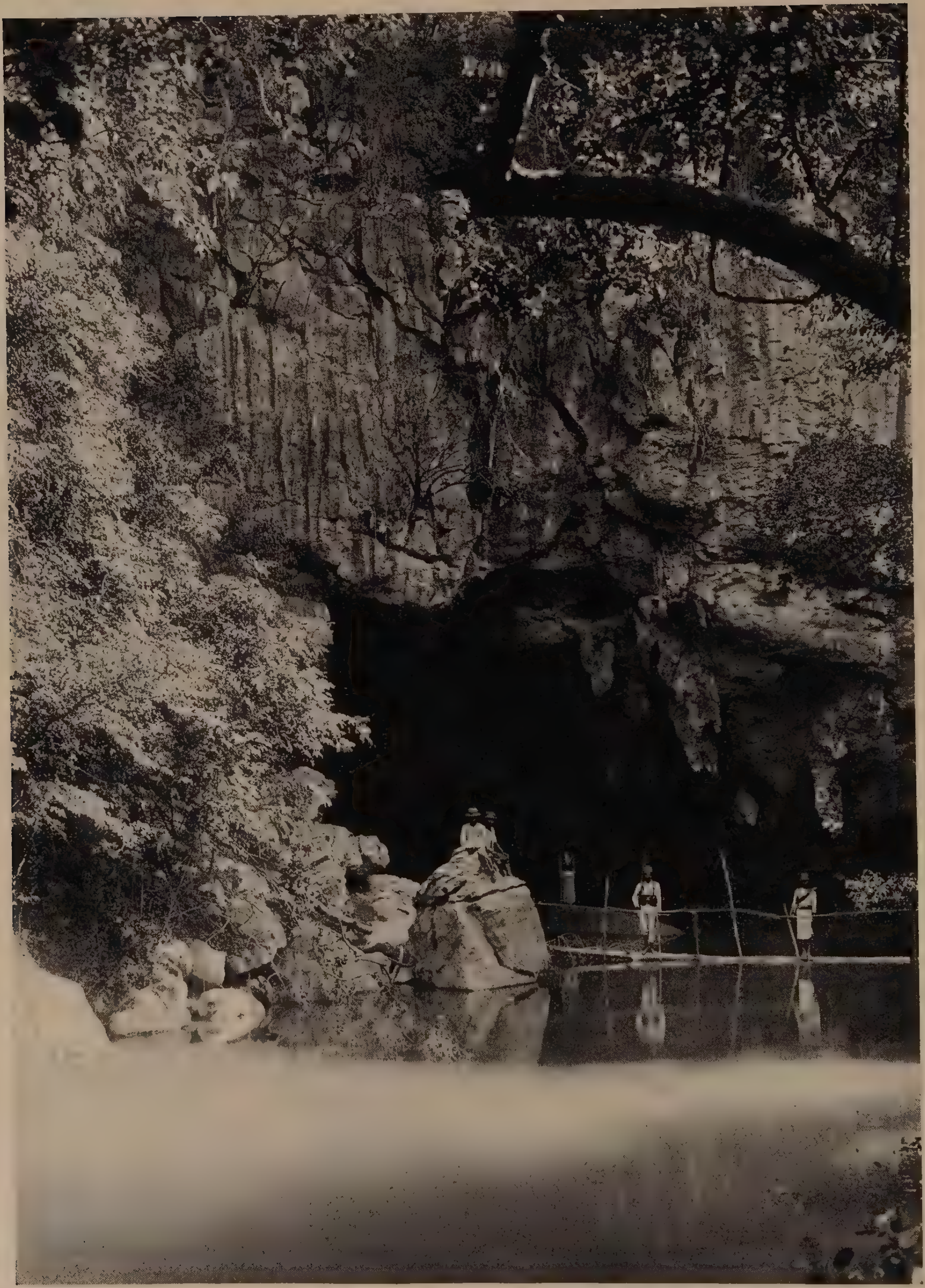
SILHOUETTE ARTISTS' SCISSORS HAVE REPLACED CORSAIR CUTLASSES

On the sands of St. Malo beach, once the gathering place of pirates, this clever Italian cuts black paper pictures of children and other visitors. Not even his prices are reminiscent of the robbers of the sea. He makes a likeness in 30 seconds and sells two for six cents.

children are marching home, marshaled by middle-aged women or priests. The last touch has been given to the fortresses of sand which will be gone to-morrow.

A woman in Breton costume passes—a little starched twist of lace for a cap, plush skirt, and lace-trimmed apron of brilliant green—a curiosity in to-day's monotony of style. Resorters are pulling down tents and rolling up tennis nets, for the tide is coming in apace, the sea again claiming its own.

A strip of sand shows white on Cézembre. Other little islands are black on a rolling, grasping, silvery sea, against a background of red. The fishing smacks are scudding for port and a hot meal. A plume of smoke floats from back of Petit-Bey Island, the Southampton steamer making out on the rising tide. The last rays of the sun dropping into the sea tip the steep roofs of slate, and the waves now are breaking against the walls, throwing spray high in the air, just as they started to batter these same walls 850 years ago.



Photograph courtesy French Colonial Office

THE RIVER ANKARANA GUSHES FROM A MOUNTAIN: MADAGASCAR

Much of France's great insular possession is rugged, and swift streams are abundant. Thus far, little has been done toward the development of power or irrigation projects, and only a few of the rivers can be used for navigation by light-draft steamers or even native canoes.

ACROSS MADAGASCAR BY BOAT, AUTO, RAILROAD, AND FILANZANA

By Charles F. Swingle

United States Department of Agriculture

With Photographs by the Author and by Prof. Henri Humbert

IT WAS the "Glorious Fourth," yet I was the only person within hundreds of miles to whom this meant anything other than the day after the third of July. Here I was, the first American botanist to set foot on the island of Madagascar, and not a single firecracker had I with which to impress the Malagash natives with the importance of the event.

But this was no time to dwell on thoughts of the homeland, for on this morning my companion, Prof. Henri Humbert, of the University of Algiers, and I were to leave Majunga, the west-coast "metropolis" of Madagascar, and start on a 1,300-mile plant hunt into the vast region to the south of the island.

There are no travel agencies in Madagascar. One simply moves when and where he can, and that leisurely. One day is as good as another to the Malagash, and to think of anyone's being in a rush is beyond his power of imagination.

Therefore it meant nothing to the easygoing natives of Majunga that our boat from France had landed us here just fifteen minutes too late to catch the little coastwise boat which we had hoped to take to Tuléar. Another mail-boat would leave in six weeks; so, according to Malagash philosophy, the situation wasn't hopeless at all. If we didn't care to wait, of course we must figure out other plans for ourselves.

Our figuring was complicated by the fact that I spoke almost no French and my companion no English. Thus, throughout the trip, we were often forced to employ German, Spanish, Malagash, and even Latin—languages strange and unfamiliar to us both, yet frequently clearer than either of our native tongues.

We found that by starting from Tananarive, the capital city, some 400 miles to the southeast of us, we could strike automobile roads leading on to the south. Thus our expedition, sponsored by the University of Algiers, the Arnold Arboretum, and the United States Department of Agriculture, could gain access to the great virgin region lying between Tuléar on the west coast and Fort Dauphin on the east (see map, page 184).

In this region, richly endowed yet grimly fortified by Nature, we hoped to make our real discoveries. The section was known to abound in valuable forms of vegetation, yet into much of it no plant collector had ever set foot. Was it any wonder that we were eager to see what was in store for us?

But getting to the capital city was by no means as simple as it sounded. We were en route six days. Three of these we spent, crowded and uncomfortable, aboard frail river craft, which meandered slowly up the brick-red waters of the Betsiboka to the nearest bus terminal (see page 194).

Throughout this part of our trip the best we could do was to trust that our tiny, overloaded boats would not be wrecked on one of the numerous snags in the river, for the water all along was teeming with crocodiles, ranging from cunning little fellows a couple of feet long to monsters of 16 or 18 feet.

The next three days by bus were scarcely less fatiguing than the water trip and equally interesting. The natives still looked upon this bus with a combination of wonder and fear. The driver had only to sound his horn to send frightened pedestrians scurrying in every direction. Once out of harm's way, they would swing around and join in a whole-hearted laugh.

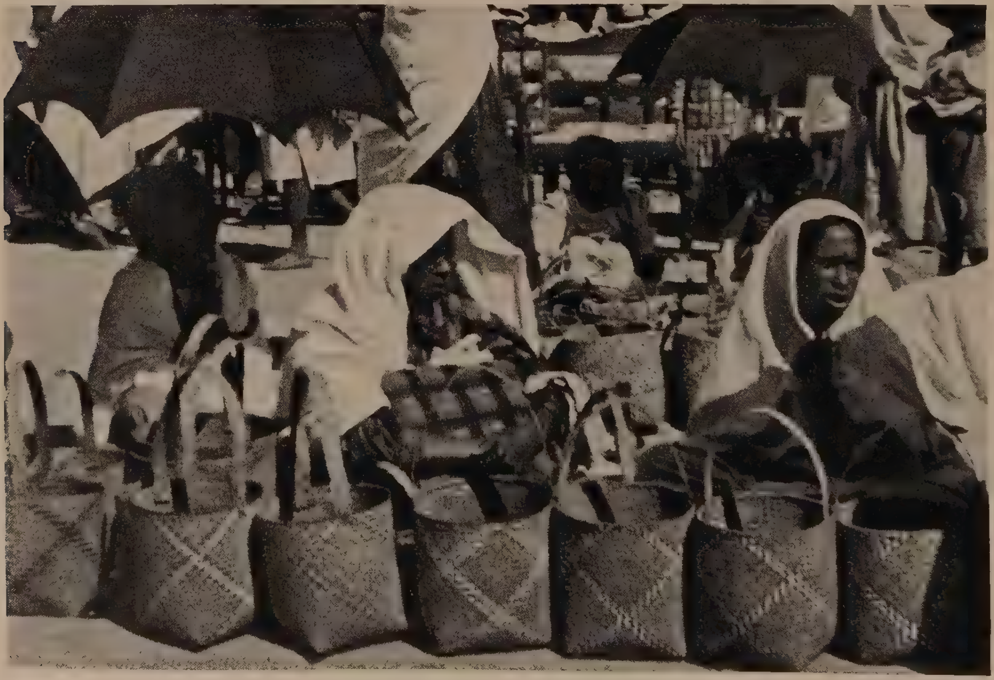
THE TRAVELER'S TREE A BOON TO THE THIRSTY

Our way lay through mountainous country. The hills, once covered by splendid forests, were now brown and barren save where grass had sprung up, as if attempting to hide the all-too-evident traces of the destruction wrought by man.

The desolation of the mountains was relieved by numerous stream valleys, where

TO MARKET, TO MARKET

Whatever they have to sell—it may be only a goose, a few eggs, or a bit of wood—the Malagash natives carry on their heads.



WHERE BASKETRY IS A FINE ART

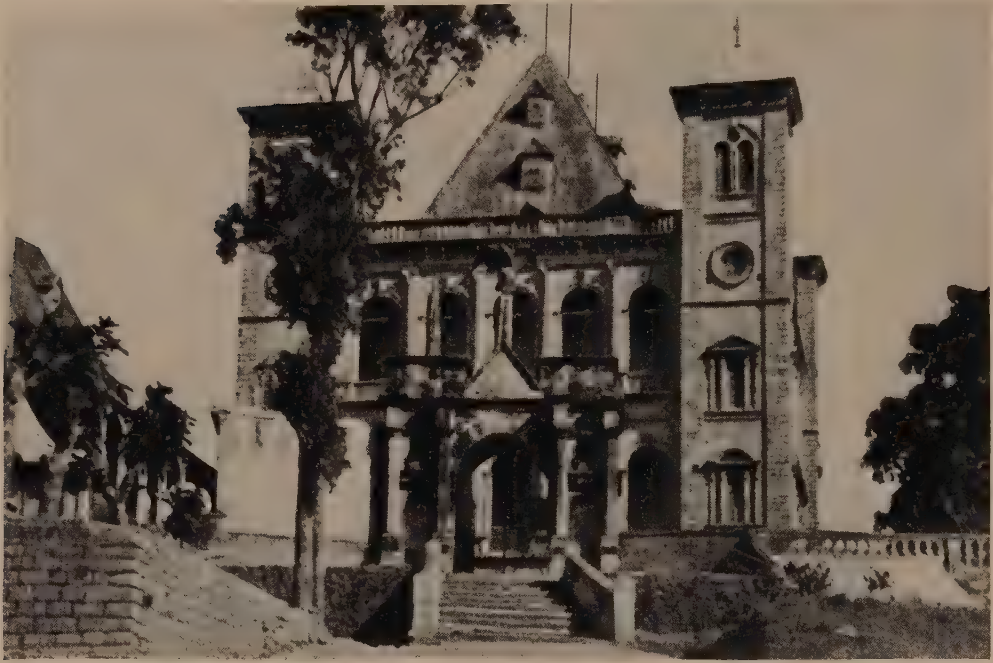
In the basket corner of the market at Tananarive the author procured a collection of 24 specimens, made to fit together like a set of mixing bowls, the diameter of the largest being 5 inches.

MORTAR MIXING IS UNUSUAL WORK FOR NATIVE WOMEN

For the most part, heavy manual labor is done by men in Madagascar, and a scene like this is rare (see text, page 186).

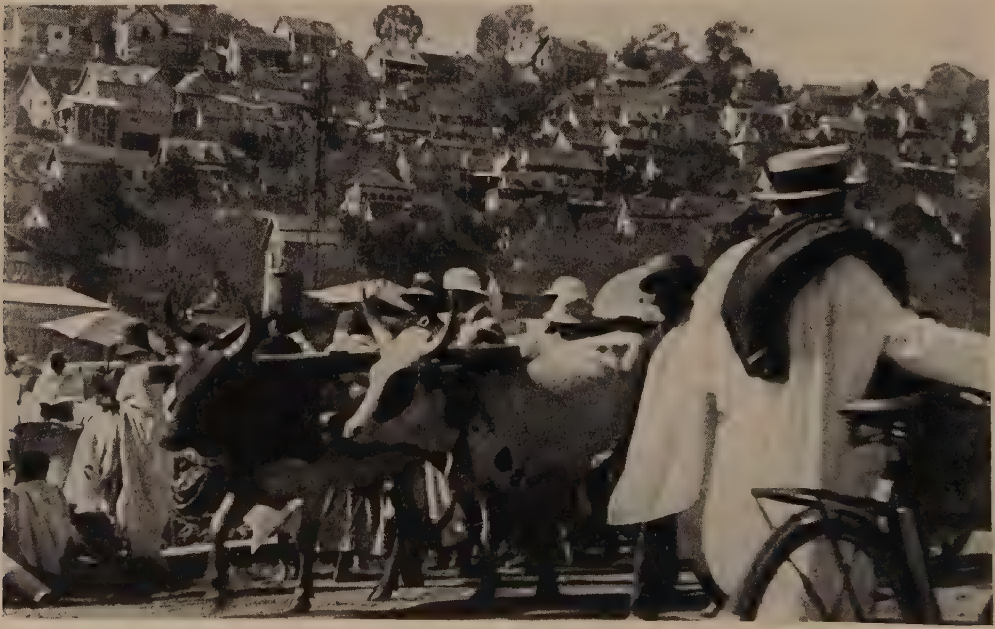
THOUGH THE MALAGASH USES NO FURNITURE, HE MAKES IT

Grass chairs, tables, and other pieces are on display in the market, but the native usually supplies his home with nothing but hand-woven mats (see illustration, page 187).



THE EXILED QUEEN'S PALACE HOUSES THE ACADÉMIE MALGACHE

In the days before the last native ruler, Ranavalona III, relinquished the throne to take up her residence in Algeria, this imposing edifice in Tananarive was the seat of government. Now it is used principally as a museum of Malagash relics.



PRIMITIVE AND MODERN CONVEYANCES "RUB FENDERS" IN TANANARIVE

Bicycles, motorcycles, and automobiles must thread their way among oxcarts and filanzanas in the streets of the Madagascar capital, with its 70,000 inhabitants, metropolis of a growing colony larger than France itself.

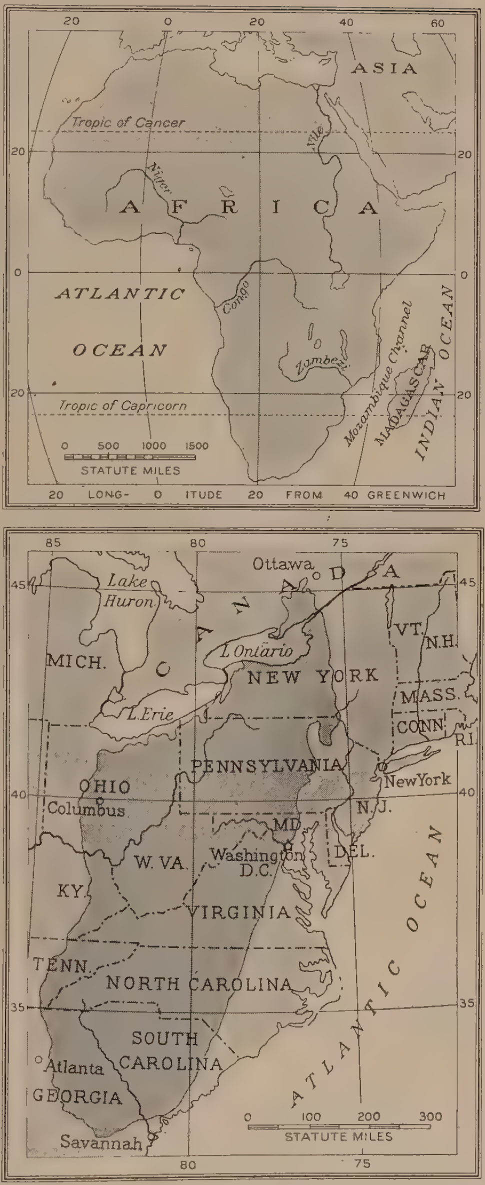
rice, the principal article of food for the Malagash, was being grown; also, in these lower altitudes, we saw many of the famous Ravenala, or traveler's tree, also known as the traveler's palm (see illustration, page 204).

I often saw the natives using the heavy broad leaves of this tree as plates from which they ate their rice. I, too, tried them before leaving Madagascar, and found them to be an excellent substitute for Haviland. My curiosity also led me to investigate the story which gives this tree its name. I found that, except in cases where insects had entered and contaminated the liquid, each hollow leaf base of this tree actually does contain from a pint to a quart of really good "distilled" water, moisture from the air having condensed on the broad surface of the leaf and run down the stem into a little reservoir at its base. Thus, as the story goes, this tree brings joy to the weary traveler, for here an ever-ready supply of fresh, cool water awaits him.

It was on this overland trip that I saw my first swarm of locusts. Strange that one born and reared in Kansas, the "grasshopper" State, should need to come all the way to Madagascar for this! It was a real swarm indeed, blackening the sky, and it took several hours for this dark cloud to pass.

I had been told that locusts were greatly esteemed by the natives for food, and a little later, at the big public market in Tananarive, I saw scores of bushels of these choice viands on sale.

Few cities in the world with a population of more than 70,000 are as untouched by the tourist as is Tananarive. Though many changes have come about in Madagascar since the French occupation of the island, in 1895, the people of the capital, housed in their simple dwellings, are living much as they always have lived. Radio towers are the only visible sign that this civilization is linked with any other. Except for these, it is not at all hard to believe oneself in another world.

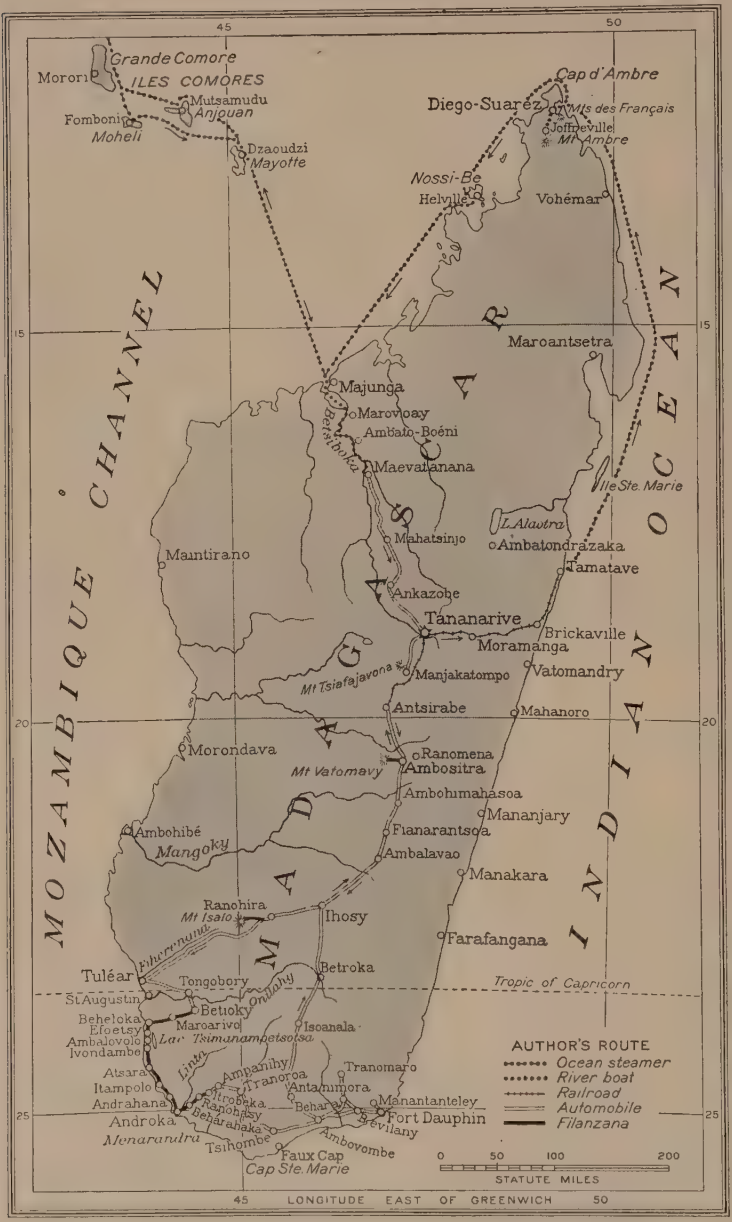


ASIA
Tropic of Cancer
Nile
Niger
AFRICA
ATLANTIC OCEAN
Congo
Zambezi
Mozambique Channel
MADAGASCAR
INDIAN OCEAN
Tropic of Capricorn
0 500 1000 1500
STATUTE MILES
LONGITUDE FROM GREENWICH
Ottawa
CANADA
Lake Huron
MICH.
L. Ontario
NEW YORK
VT.
N.H.
MASS.
CONN.
R.I.
L. Erie
PENNSYLVANIA
New York
OHIO
Columbus
N.J.
MD.
DEL.
W. VA.
Washington D.C.
KY.
VIRGINIA
TENN.
NORTH CAROLINA
SOUTH CAROLINA
Atlanta
GEORGIA
Savannah
ATLANTIC OCEAN
0 100 200 300
STATUTE MILES

MADAGASCAR IN ITS RELATION TO AFRICA (ABOVE) AND COMPARED WITH OUR EASTERN STATES (BELOW)

Only four islands of the earth are larger than Madagascar—Greenland, New Guinea, Borneo, and Baffin. If superimposed upon the United States, it would extend from Ottawa, Canada, to Savannah, Georgia. It equals in area all of the New England and Middle Atlantic States, with Virginia, Maryland, and Delaware added.

Tiny dwellings of unburned brick dot the hillsides of the capital. Occasionally one sees a wooden structure, or one built of stone, and often a two-story edifice looms above its neighbors. Dominating all, the "Palace of the Queen" towers magnificently on a lofty hilltop in the center of the city. This building, since the exile of Madagascar's last native ruler,


45
50
Grande Comore
Moroni
ILES COMORES
Mutsamudu
Anjouan
Fomboni
Moheli
Dzaoudzi
Mayotte
Cap d'Ambre
Diego-Suarez
Mts des Français
Joffreville
Mt Ambre
Nossi-Be
Helville
Vohémar
MOZAMBIQUE CHANNEL
MADAGASCAR
INDIAN OCEAN
15
Maroantsetra
Majunga
Marovoay
Ambato-Boéni
Betsiboka
Maevatanana
Ile Ste. Marie
L. Alaotra
Mahatsinjo
Ambatondrazaka
Maintirano
Tamatave
Ankazobe
Tananarive
Brickaville
Moramanga
Mt Tsiafajavona
Manjakatompo
Vatomandry
Antsirabe
Mahanoro
20
Morondava
Ranomena
Mt Vatomavy
Ambositra
Ambohimahasoa
Mananjary
Ambohibé
Fianarantsoa
Mangoky
Ambalavao
Manakara
Ranohira
Mt Isalo
Ihosy
Farafangana
Fiherenana
Tuléar
Tongobory
Betroka
Tropic of Capricorn
St Augustin
Onilahy
Betioky
Beheloka
Efoetsy
Maroarivo
Isoanala
Ambalovolo
Lac Tsimanampetsotsa
Ivondambe
Linta
Atsara
Ampanihy
Tranoroa
Tranomaro
Itampolo
Antanimora
Itrobeka
Andrahana
Ranohasy
Behara
Manantanteley
Fort Dauphin
Androka
Beharahaka
Sevilany
Menarandra
Tsihombe
Ambovombe
Faux Cap
Cap Ste. Marie
25
AUTHOR'S ROUTE
Ocean steamer
River boat
Railroad
Automobile
Filanzana
0 50 100 200
STATUTE MILES
45 LONGITUDE EAST OF GREENWICH 50

Drawn by A. H. Bumstead

THE AUTHOR'S ROUTE AND HIS MEANS OF TRAVEL IN MADAGASCAR

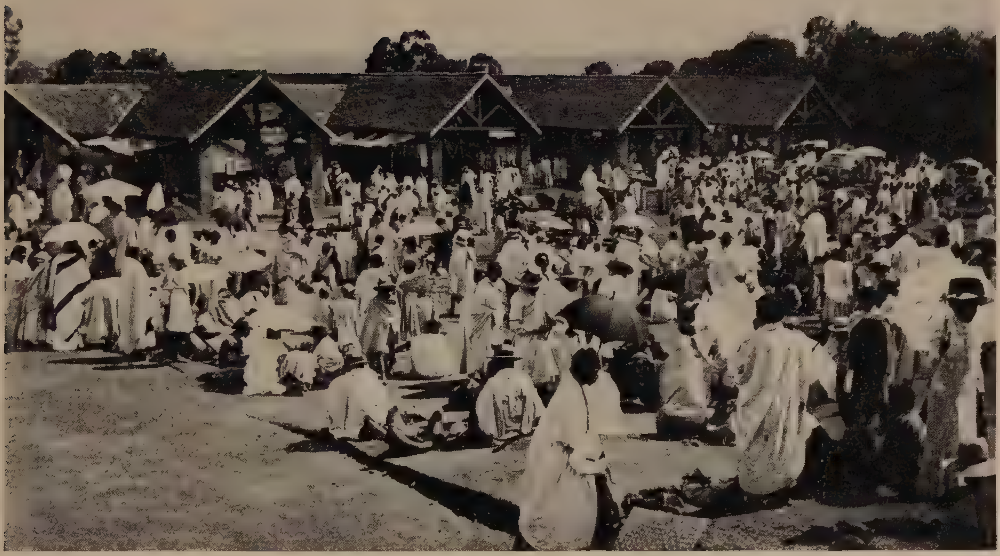
Although the botanist finds much of interest in any part of Madagascar, it was in the desert region lying between Tuléar and Fort Dauphin that this expedition made its chief discoveries. Into much of this region no plant collector had ever before set foot.

Queen Ranavalona III, has been used as a national museum, and it houses many valuable relics of the Malagash people.

Here we had a fine opportunity to study the customs and history of these handsome, straight-haired, brown-skinned people of mysterious origin. The Malagash are considered to be Malayo-Melanesians, probably coming from the island of Sumatra; yet, so far back as history goes, they have been loath to venture far from land in their frail canoes. How they managed to transport themselves for thousands of miles, across the Indian Ocean, to their present island home is an interesting puzzle. Equally interesting is the fact that, although Madagascar lies only 240 miles off the east coast of Africa, the natives show little mixture with African blood.

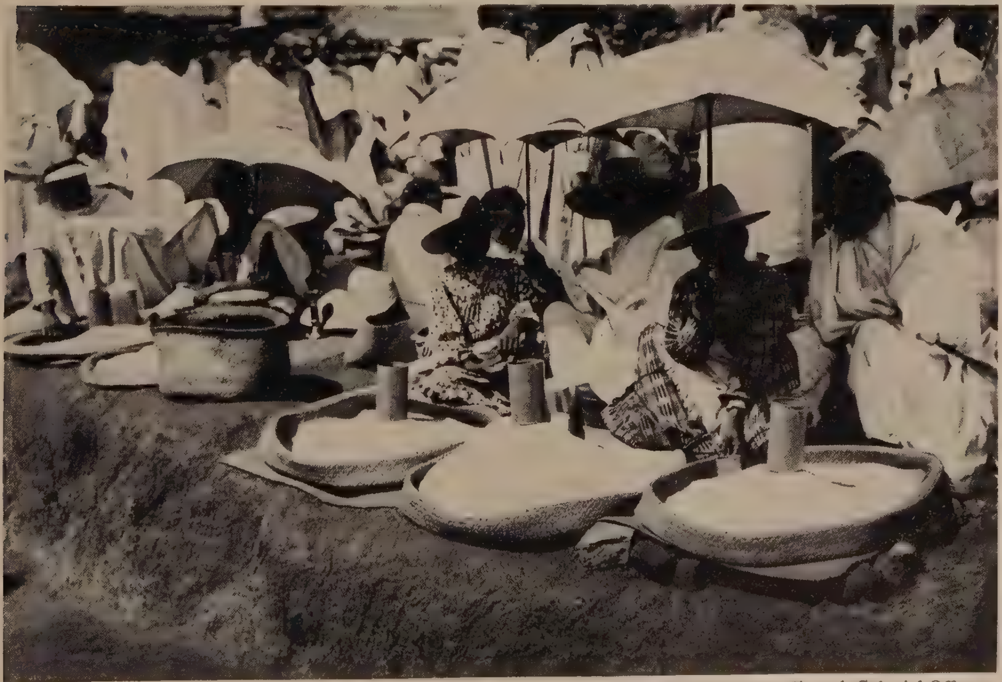
The language of the Malagash is the clearest indication that their ancestors were of common origin; for, save for differences in dialect, the language is uniform throughout the entire island. This is significant, considering that its peoples are made up of many different tribes, one part of the island having little contact with another. It was only after the advent of the Christian missionaries, a hundred years ago, that this language was written down and put into the phonetic form now in use.

When one enters a one-room Malagash home, stooping low in order to get through the tiny doorway, he sees little in the way of furniture. A large mat on the floor, a fireplace with no outlet for the smoke, a



THRONGS COME TO THE MARKET AT FIANARANTSOA

The *zoma* (Malagash for both shopping center and Friday, the day of trade) is always the most popular place in a Madagascar town. Here all manner of merchandise is bought and sold, and cast-off European finery is eagerly sought, as the woman in the extreme right foreground bears witness (see text, page 187).



Photographs courtesy French Colonial Office

RICE IS THE STAPLE FOOD FOR MOST OF THE MALAGASH

Merchants squatting on the ground in the market at Fianarantsoa sell great quantities of this indispensable cereal. Madagascar is a land of plenty. The standard ration for a workingman, two pounds of the dry grain a day, is frequently consumed at a single meal (see page 196).

Photograph courtesy French Colonial Office

FIANARANTSOA HAS ITS CATHEDRAL

When the French occupied Madagascar in 1895, they found 20 Christian churches in Tananarive alone and several in this city. English, Norwegians, and Americans played an important rôle in civilizing the country. To-day religious activities are being taken over more and more by workers from France, and education is handled by the island government, but 29 families of missionaries from the United States are still stationed in the extreme south (see text, page 208).

few baskets of rice, a huge iron pot for cooking it, one or two earthen jugs or large calabashes for water, and the Malagash home is complete—or almost so. Of course, to be really fashionable, it must have a few good-luck charms and beautiful cast-off trinkets about. Nor must I fail to mention the sooty cobwebs which, hanging in festoons from the ceiling, give the place its air of permanence.

The woman in Madagascar ranks high. This may be due partly to the fact that for many years preceding the French occupation, the island was ruled almost continuously by native queens. In any case, the lot of woman here is much the same as if she had been born to less primitive surroundings. Of course, she must daily husk and cook the family rice, carry wood and water for her household, and do the marketing for the family, but one rarely sees her doing man's work.

I do not mean to imply that the men of Madagascar are in any sense "henpecked." The struggle for existence seems to have passed by this island entirely. A few days' work planting, transplanting, and harvesting rice, and food is available for all throughout the year. One could almost say that the chief occupation of the men is tending and stealing cattle.

MADAGASCAR'S CHIEF PRIDE IS ITS CATTLE

Madagascar boasts that it has more cattle per capita than any other country in the world, and far more important to the native than a bank account, a bag of jewels, or a fine home is his herd of humpback zebus; for these bespeak his wealth and influence as nothing else could. He would much prefer to let his wife and children go hungry than to sell one of his precious herd. To kill a beef for food is unthinkable, and it is only at taxpaying time that he is forced to slaughter some of his animals and sell their hides to obtain cash.

Since cattle are the one sure sign of social prominence, they are to be obtained at all hazards. And here, to a large extent, lies the origin of the frequent statements that the Malagash are a thieving race. In all my travels in Madagascar our party did not once lose a single article by theft. However, no Malagash can call himself a man who cannot boast of the cattle he has stolen. In the eyes of the natives, cattle-stealing is not a crime, but the highest type of sport.

From my observations, I should say that cattle-stealing in Madagascar ranks along with football in this country. Among the natives it bears no more relation to the struggle for existence than does our popular sport, nor is it to be considered as any more dangerous.

Photograph courtesy French Colonial Office

CARPET WEAVING

In every house there is a covering of coarse matting over the earth floor. Such mats are often the only semblance of a bed the family possesses. Household furniture is reduced to bare essentials (see text, pages 184-186).

LOCUSTS AND EMPTY BOTTLES ARE MERCHANDISE IN MADAGASCAR

The *zoma,* or market, at Tananarive is one of the most interesting sights in Madagascar. On market day, in from the country stream the natives, walking for miles, bringing their wares with them, balancing their loads upon their heads—baskets of eggs and rice, piles of bright-colored mats, live chickens and geese.

Though market day is quite a festive occasion, the native wears only his ordinary clothes here. His everyday *lamba* is made of unbleached muslin, and, wrapped in it, he looks as if he were on his way to a Halloween celebration.

Though the word *lamba* is usually translated as shawl, it means much more than this to the Malagash. It serves as a blanket at night and does duty as a spine pad when the owner is doing heavy work. Occasionally it is used as a net for catching locusts.

For really festive occasions, such as a funeral or a marriage, the natives have a gay shawl, often made of a Madagascar silk. But, no matter how decorative his attire, the Malagash feels that he is not really well dressed without a modern touch of some sort. In their process of becoming civilized, the natives are not merely changing the old for the new, but are adding the new to the old with amaz-

Photograph courtesy French Colonial Office

OLD AND NEW MINGLE IN A BETSILEO VILLAGE

Though many of the houses of this central Madagascar town are substantially built and rather modern in appearance, none have chimneys; and at meal time, when smoke pours out through doors, windows, and grass roofs, they appear to be burning down. The women at work before the dwelling on the left are husking, with a large wooden mortar and pestles, the daily supply of rice for the family.

ing results. At one of our first stops in Madagascar we had been greeted by a native wearing an ankle-length nightshirt and a silk stovepipe hat!

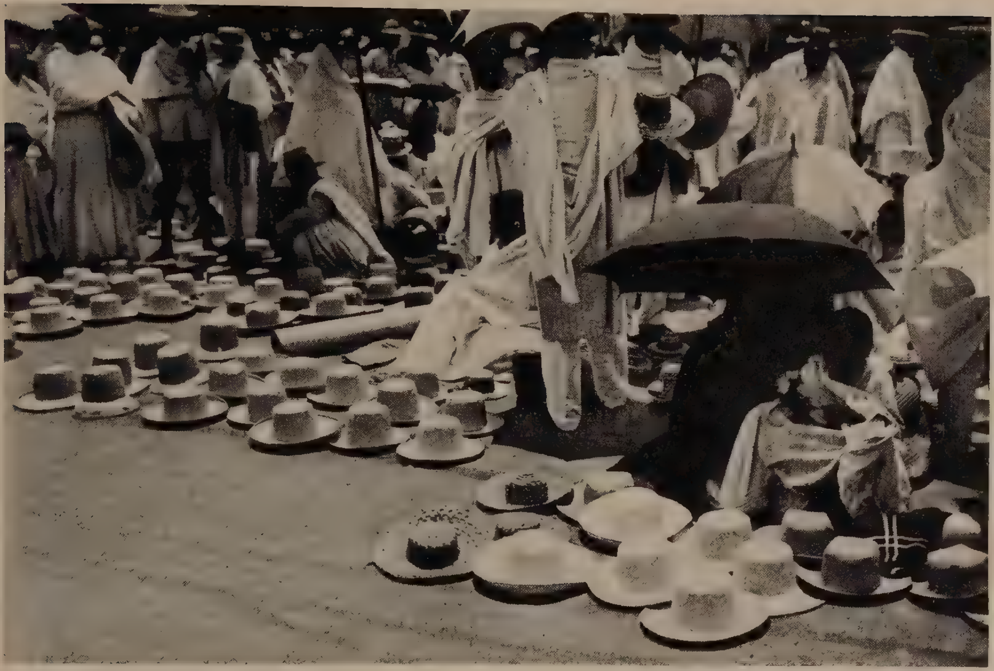
At the Tananarive market I was able to buy few of the articles which civilization had taught me to depend upon. However, I saw a myriad of things which bring joy and delight to the Malagash—piles of wearing apparel of a forgotten European style, strange and doubtful native medicines, baskets of locusts, empty bottles, and tin cans.

It must not be inferred that I found nothing on sale here that I could use, for Tananarive is no exception to the rule that hotel accommodations in Madagascar range from *very bad* on down. Hence I made daily trips to the market to procure peanuts, bananas, pineapples, guavas, loquats, mangoes, oranges, and papayas with which to supplement our hotel diet.

I was told that the Malagash language has in it no word for time; a glimpse at the market tends to confirm this. Here the native, after spending a day or so walking to town, is content to sit waiting several days for a customer to buy the armful of wood or the chicken he has brought to market. Once in possession of the few cents his goods have sold for, he carefully selects a prize from the many lots of clothing or trinkets on display and happily wends his way homeward, feeling very grand in the derby hat, the overcoat, or other bit of finery he has purchased.

Most of our time in the capital was spent in arranging with colonial officials for our trip into the south. We planned to make an overland journey, gathering whatever interesting plants we might find en route to Tuléar. Our course into the wild desert regions which lay beyond Tuléar we left to our imaginations for the time being.

I doubt if the finest *de luxe* train in the world ever carried more appreciative passengers than did the tiny wood-burning,



Photograph courtesy French Colonial Office

HATS OCCUPY MUCH SPACE IN FIANARANTSOA MARKET

To the native, head coverings are important as both wearing apparel and dishes (see text, page 197), but those with brims are more or less of a luxury. The poorer class usually have only boxlike hats, and not always these. "Fianar," as this city is commonly called, is the second largest inland town in Madagascar, being exceeded by Tananarive alone. It is the pride of the Betsileos (see illustration, page 190).

narrow-gauge railway train on which we rolled out of Tananarive. This was our first train ride in Madagascar and the last we would have until our return from the south. So our trip was all too short—only a few hours before we reached the end of the line.

ANTSIRABE IS MADAGASCAR'S HEALTH RESORT

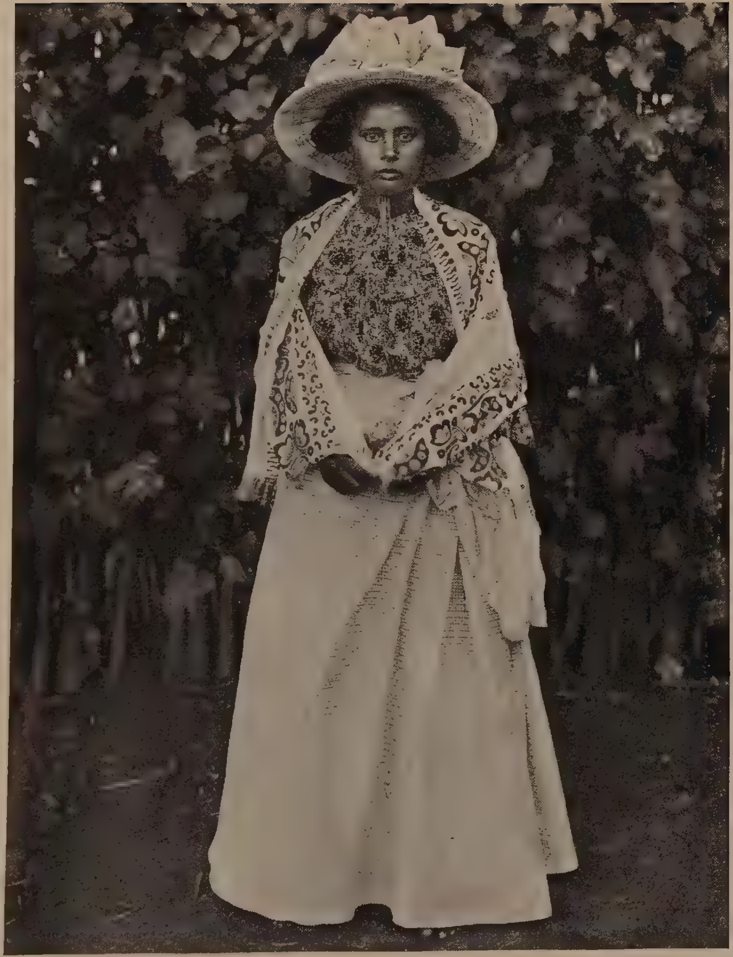
In striking contrast to Tananarive was the modern French city of Antsirabe, in which we alighted. We were indeed in the Vichy of Madagascar, the health resort of the island, where some of the finest curative hot springs in the world are to be found. It was hard to believe that this city, with its fine homes and its well-planned streets and parks, was actually a part of the Madagascar in which we had been traveling.

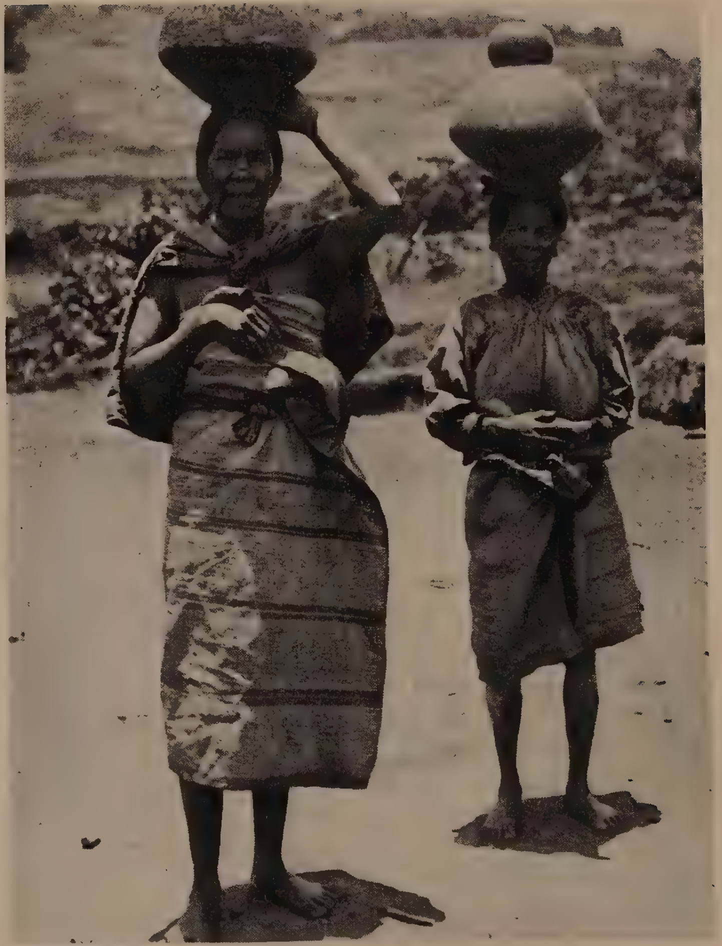
But we had no time to stop at this attractive place. On the first leg of our 600-mile journey down the central plateau of Madagascar we traveled in automobiles loaned by colonial administrators.

When we had gone about two-thirds of the way the character of the country changed. As we crossed the northern boundary of the region of the south we entered a drier country. The landscape took on much the aspect of the butte country of eastern Utah.

The natives here were more primitive than those to the north. The men carried formidable-looking spears and their clothing rarely consisted of anything save the lamba. This they commonly wore wrapped around the waist, more as a body support when doing heavy work than as a concession to modesty. Many of the children wore no clothes at all.

We had to send ahead to Tuléar for the only available truck in this section of Madagascar, to pick us up for the last 200 miles of our journey. Since there are no towns along this last stretch, the traveler over the recently completed road must be





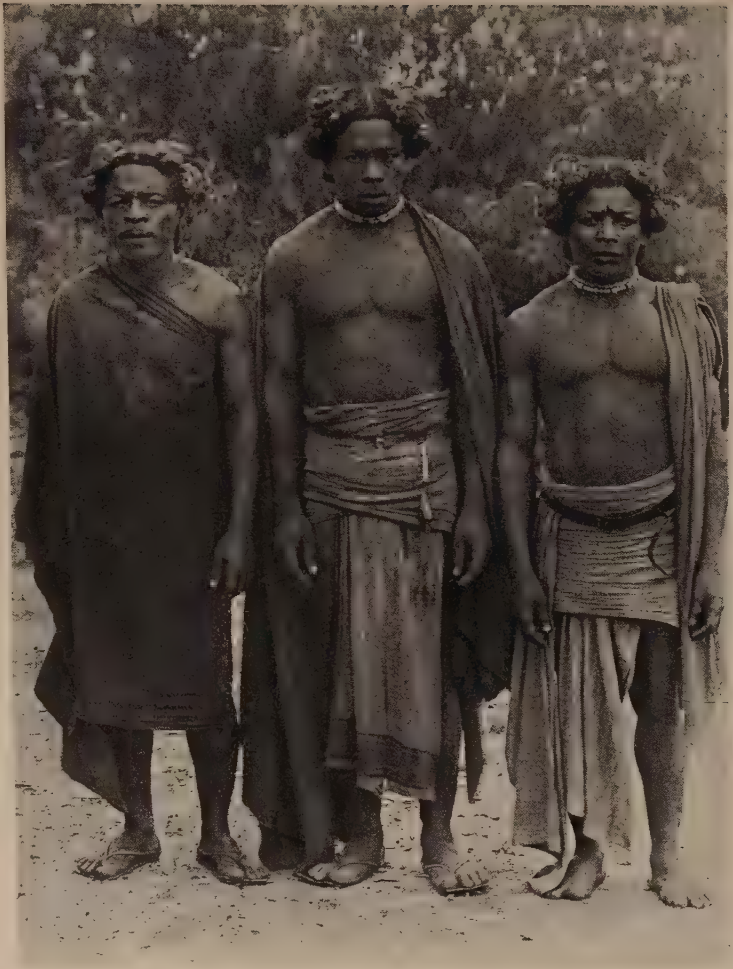
Photographs courtesy French Colonial Office

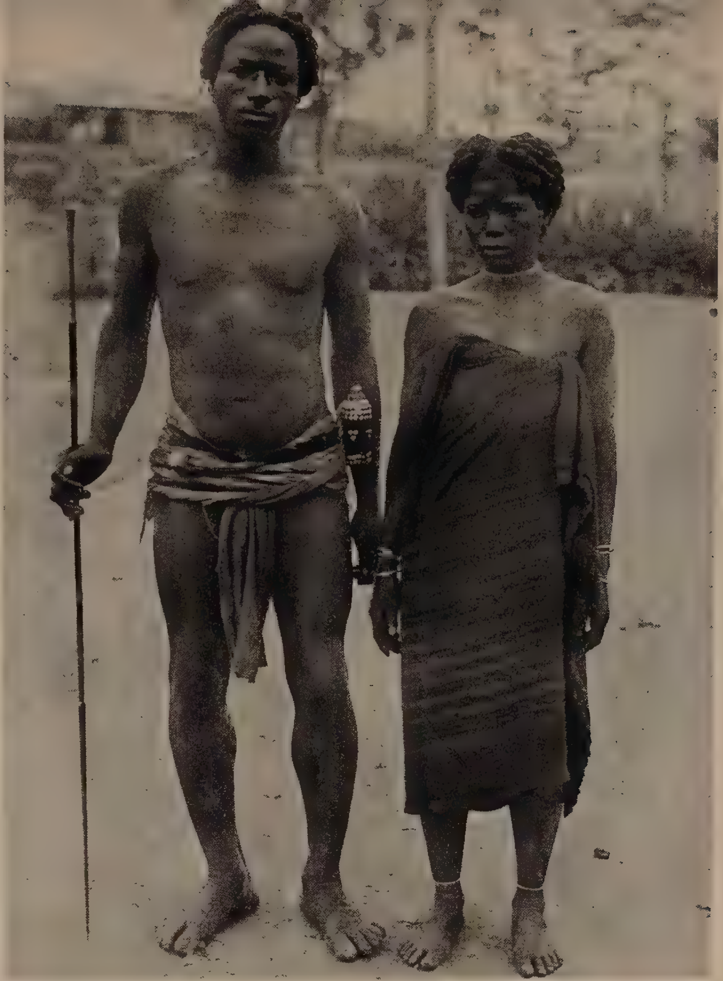
EUROPEAN APPAREL DELIGHTS THE HOVA GIRL

Erect, proud, intelligent, this young woman of Tananarive is of the brown rather than the black race (see text, page 184). She is barefooted, despite her foreign clothing, and keeps at least a semblance of the ever-present native *lamba*, or shawl.

BETSILEO WOMEN CARRY WATER FOR THE FAMILY

Many villages in the south of Madagascar are miles from any spring or stream (see text, page 198), and mothers and daughters of the households trudge for hours across the hot sands bearing the clay jugs upon their heads.





Photographs courtesy French Colonial Office

MAHAFALY PORTERS PLASTER TALLOW IN THEIR HAIR

These workers of southern Madagascar are a happy, carefree lot. Two of the men in the picture are wearing sandals of untanned skin, used for travel over stones and thorns.

ANTANOSY TYPES LIVE NEAR FORT DAUPHIN

Though all the Malagash except the Hovas (see illustration, page 190) have a trace of African blood, they are largely of Malayo-Melanesian stock (see text, page 184).

WHERE THE DRUG STORE HAS NO LUNCHEONETTE

At a busy corner of the market, native herbs are sold, but the customer must go elsewhere for his cigars and light refreshments.

sure to take sufficient supplies, both of gasoline and of good luck, with him. Few cars pass this way; even the mail throughout the south is carried on foot, two men bearing 88 pounds on a pole between them.

One evening while camping, as usual, in the *case passage,* a tiny grass hut which, in all remote sections of Madagascar, is provided for European travelers, we were entertained by the passing of a funeral procession. When I heard voices blended in a weird and fascinating chant, my first impulse was to rush outside and watch the mourners as they passed; but my companion warned me against advertising my presence.

The Malagash, while not ordinarily fond of *toaka* (rum), always make a funeral the occasion for consuming great quantities of it.

What I saw and heard from my obscure position inside the hut reminded me of the nightshirt parade which features some of the football "pep" meetings in America.

BOTH ROOMS OF TULÉAR'S GRAND HOTEL WERE OCCUPIED

Rumors of good accommodations in Tuléar had led us to look forward to a few days' rest before forging ahead into the desert, but the Grand Hotel proved to be grand only in name; its two rooms were already occupied!

CAMP MEANS A GOOD TIME TO MALAGASH PORTERS

After a day's march of 25 miles, the natives like to talk and sing all night, especially if the moon is bright and they are not thirsty (see text, page 203). Water is carried in calabashes, one of which may be seen in the right foreground.

We took time while in Tuléar to indulge in the novelty of hunting eggshells of the recently extinct Æpyornis, one of the largest birds known, and possibly the roc of the "Arabian Nights." While we were not lucky enough to find any entire eggs, we found fragments up to six inches across. Some of them were in a semifossil condition, buried a yard under the sand, while others were lying exposed on top of the rocks (see pages 196, 197).

One of the queerest plants we saw in the south was the cactuslike Didierea, which grows along the coast. Its long, leafless arms, unlike the branches of other trees, bend *toward* the wind, reaching out into it, as if eager to show themselves masters of the monsoon.

Even though the collector is sure to find many plants of value in any part of Madagascar, our objective was the desert region lying between Tuléar and Fort Dauphin, where, among other things, we hoped to find specimens of an almost extinct rubber plant, *Euphorbia intisy*.

We tarried in Tuléar a week, taking care of the plants we had collected along the way. Then, once more calling upon the only truck for hire in this part of the island, we pushed on, a day's journey to a small village on the edge of the desert.

PRIMITIVE CRAFT PLY THE BETSIBOKA RIVER

Man power at 12 cents a day is much cheaper than gasoline at 80 cents a gallon (see text, page 197). Travel in Madagascar is slow but inexpensive.

Photograph courtesy French Colonial Office

"STEAM ROLLING" IS DONE BY MAN POWER

Madagascar has some surprisingly fine highways, all built since the French occupation, at an extremely small outlay of cash. A system of universal taxes, similar to the old road poll of the United States, has provided the labor necessary to construct thoroughfares, excellent for automobile traffic, linking Tananarive with Tuléar, Ambovombe, and Fort Dauphin.

LAKE TSIMANAMPETSOTSA HAS NO OUTLET

This shallow body of water is a bitter disappointment to the thirsty traveler, for the milk-white fluid is utterly undrinkable. The natives consider it poison (see text, pages 200-1).

FILANZANA RIDING ADDS NOTHING TO ONE'S DIGNITY

To sit on a precarious seat slung between two long poles resting on the shoulders of four porters is not a comfortable experience. Walking is far pleasanter and more conducive to a feeling of independence, but the author was forced to conserve all his energy (see text, page 197), and traveled many miles in this way (see map, page 184).

HUNTING EGGSHELLS IS A POPULAR SPORT NEAR TULÉAR

In such sandy banks fossilized fragments of the enormous eggs laid by the Æpyornis abound (see illustration, page 197; also, text, page 193). This huge bird, now extinct, is believed by some scholars to be the roc of the "Arabian Nights."

Here we organized for the serious business of entering the brush.

READY TO ENTER THE BRUSH

It was necessary to invoke all the authority of the local government to get native porters for our expedition, for only too well did they know the dangers of the desert.

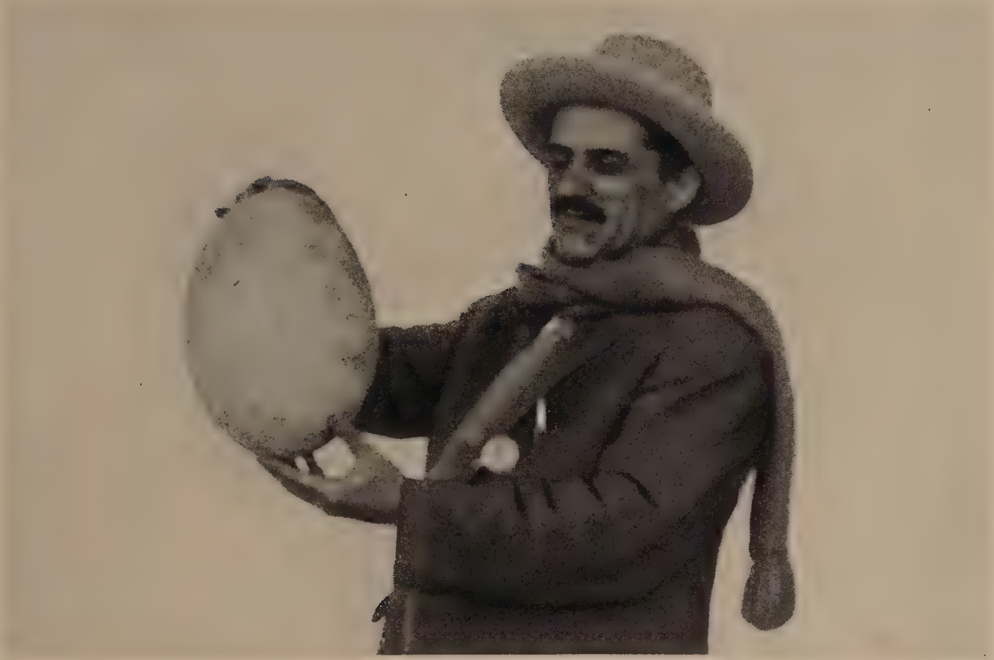
Finally, 38 men were rounded up and threatened with 15 days in jail if they should desert us. A native soldier was sent along to lend an air of authority.

Our main concern was an adequate water supply, for we knew that waterholes would be scarce in the land which we were about to enter. We likewise knew that 40 active men would require water—lots of it. On the other hand, it was foolhardy to make our load too heavy. So, hoping to reach waterholes within a few days, we decided to take along about 60 gallons. This we put into two canvas bags, each suspended on poles and carried by four men.

We were a queer-looking party, as we set forth on our 20-day march into the desert wilds. As usual, our indispensable white cork helmets were in striking contrast to our khaki hiking clothes and our thick leather leggings. The traveler in Madagascar needs not only to protect his head from the blistering heat of the sun and his eyes from its blinding rays, but if he enters the brush he must take care that his legs are well fortified against the vicious thorns.

Our chief food supply was rice. We allowed more than two pounds of the dry cereal a day for each of our porters. It was not an uncommon sight to see them cook and eat this enormous amount at one meal, but they were never quite satisfied without a drink of *varendrano* (rice water) to top off the dinner. It is customary in preparing rice to let a small portion of it burn and adhere to the kettle. Varendrano is made by pouring cold water over this browned crust and bringing the mixture to a boil. The resultant "dishwater" is the Malagash delight.

One would expect that containers in which to cook this essential food would have formed a necessary part of our load.



EGGS OF THE EXTINCT ÆPYORNIS ARE AMONG THE LARGEST KNOWN

Fragments of shell up to six inches across are often found near Tuléar, some in a semi-fossil condition, buried in the sand, and others exposed upon the rocks (see, also, illustration, page 196). Only about a dozen entire specimens such as this have been discovered (see text, page 193).

But not so, for every good Malagash household has its huge iron kettle, which for a handful of rice the owners are more than willing to lend.

Neither was it necessary for the natives to carry dishes on which to serve their food. When, at the first meal, I saw them eating from tightly woven little grass baskets, I was curious, for I knew no baskets had been packed. A little later the puzzle was solved, for after cleaning up their rice via wooden spoon and fingers, they placed the baskets—their straw hats—back upon their heads.

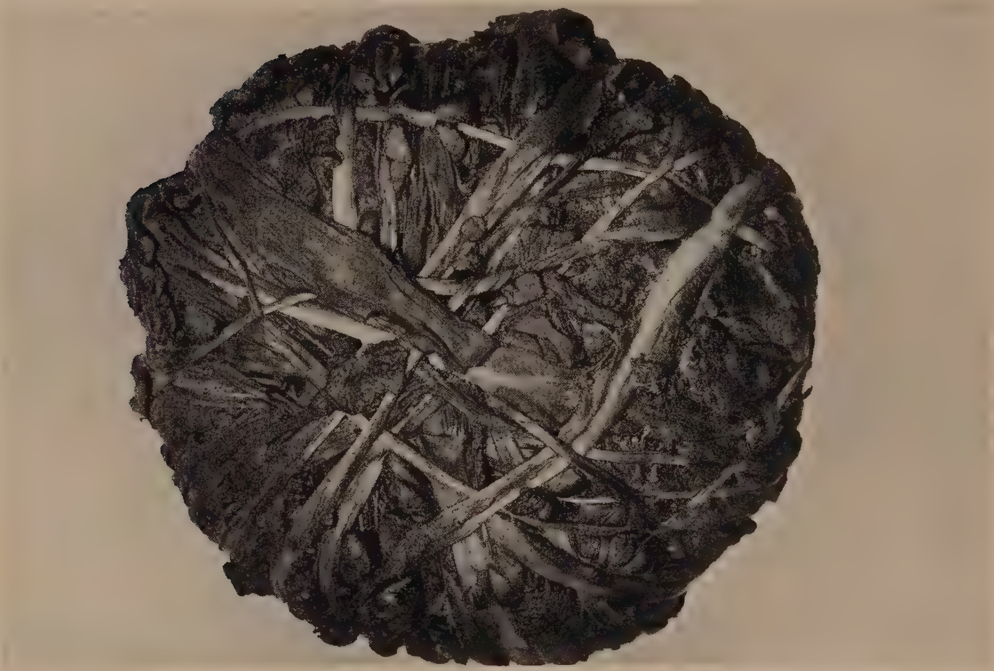
BOB-BOBBING IN A FILANZANA

The most extraordinary items in our equipment were the two *filanzanas* in which my companion and I were to ride. I had had my introduction to this "most comfortable uncomfortable" vehicle on several short excursions, for the filanzana is quite the commonest means of getting about in Madagascar. It consists of a chair swung on two 10-foot poles, and is carried on the shoulders of four stalwart natives. These alternate every five minutes with four others, so that a filanzana crew consists of eight men. Thus we had 16 porters whose sole duty it was to carry my companion and me.

One unacquainted with the Malagash might consider the filanzana bearer, who receives only 12 cents a day for his services, a very much downtrodden man; but he has no such thought, for as he trots along his laughing and chattering never cease. To his mind it is an honor to be one of the filanzana crew, and his contempt for the lowly baggage carrier is very amusing.

As I was trotted along, suspended in mid-air, I felt that I had neither dignity nor independence. It would have been much pleasanter to walk than to go bob-bobbing up and down in my lofty perch in the filanzana. However, my companion and I were forced to conserve our energy, for we feared the enervating climate of the Tropics.

In spite of our efforts to minimize our loads, most of our porters were carrying



Photograph by Robert Taylor

VIRTUALLY PURE RUBBER OOZES FROM THE INTISY PLANT (SEE PAGE 205)

Formerly hundreds of tons of this product were shipped from southern Madagascar every year. Now such balls reach the market only occasionally. No treatment is necessary in preparing this gum. A cut is made on each stem, and from the incision a milky juice runs out and hardens into bands of wonderful elasticity. The natives strip off the strings and wind them into compact masses, always incorporating plenty of dirt and stone to increase the weight.

more than the usual 50 pounds each. We had gone only a few miles when we decided we would have to lighten our burdens. The water bags proved to be especially heavy and cumbersome. Of course, we could not afford to waste any of the precious water we had brought along, but each of the men was urged to drink all he wanted. We put much of the remainder into 30 calabashes—large, jug-like gourds — which we commandeered from the natives. In this way the load was more evenly distributed.

THE WATER SUPPLY FAILS

We hoped to replenish our water supply at one of several villages which lay in our path, but in each of these tiny communities, boasting not more than a dozen or so grass huts, we found the natives had barely enough water for their own needs. In fact, so precarious was their situation that women of the village were often seen collecting the early morning dew from the bushes on which it gathered during the night. This they did by beating the branches with heavy paddles, making sure that every bit of the water fell into their thick clay jugs.

The end of the second day found us practically without water. Naturally, there was nothing to do but push on. The worst of the trip lay ahead. The porters became fearful and began to complain.

The horror of the following day is beyond description. Early in the morning tremulous cries of *"Tsy mish rano"* (no water) rent the air; but, in contrast to their grumbling attitude of the previous evening, the porters soon became quiet and resigned. The inevitable was upon us and we must face the dread reality. Not a word did we hear from our men, as bravely they pushed forward. When one of their number dropped to the ground exhausted, there was not a murmur. We could stop only long enough to moisten the fallen man's lips with a few remaining drops of water in our own canteens, and then march on, leaving him to his

Photograph courtesy French Colonial Office

NATIVES GO TO THE GRAVE ON THE SHOULDERS OF THEIR FRIENDS

A funeral means a period of feasting and gaiety which lasts for several days (see text, page 192).

fate. It was a gruesome march, for soon another fell; then another, and another, and still another. It seemed cruel to leave these five faithful servants apparently dying by the trail; yet the one thing they needed we could not offer.

We must proceed on foot, of course, now; for, while we did not know how far ahead it was to water, we knew it was out of the question to reach any by going back. Finally our perseverance was rewarded. Toward the middle of the afternoon we came in sight of a village and we took on new courage. Fortunately, we found water, very bad water, and just enough of it so that we could each have a sip, after we had sent back men and women of the village to rescue our fallen porters.

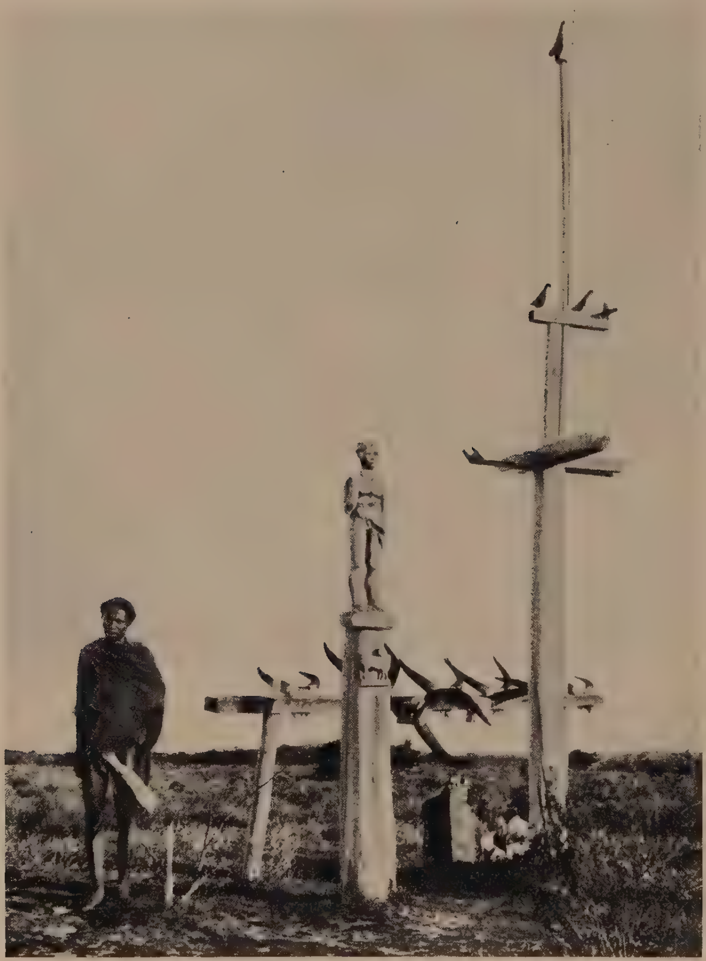
Summoning a small boat, I set out with a company of villagers, along with a few of our porters, to obtain enough water for our immediate needs and to replenish our supply for the morrow. Walking back to the village from the waterhole, the exertion proved too much for me and twice I went down. I was alone, the others having gone back by boat while I returned overland to look for plants.

Both times, after a short rest, I was able to get to my feet and drag on, and I returned to the village at dark, completely exhausted. The fatigue probably brought on the slight attack of malaria which followed, and, though I managed to keep going every day, it was a long time before my normal strength returned.

THE STRICKEN PORTERS RECOVER

Fortunately, none of the five porters who had collapsed died; all rejoined our party within a few days. However, two of them were barely able to drag along, much less able to do any work, for the remainder of the trip. In fact, not one of our 38 men was able to carry a full load after our desert experience, and we were forced to proceed at a much slower rate, many of the porters lagging behind as much as a day's march.

Whenever we could, we persuaded men of the villages to accompany us on a day's march, thus easing our own porters' burdens. But recruits were hard to get. In-



GRAVE ORNAMENTS SHOW THE WEALTH OF THE DECEASED

Oxen are killed for the funeral feast and their horns put up over the place of interment. A man's standing in the city of the dead is determined by the number of animals slaughtered to feed the celebrants of his last rites.

deed, we passed through so many entirely female communities that it finally dawned upon us that somehow the natives had suspected our mission and the men were in hiding.

Water throughout the entire region was scarce and bad and we spent many days of torturous longing. Many times we had our hopes built up only to find a dry waterhole or one in which the water was so charged with minerals that we could not drink it.

The water was always dirty, for the animals of the region had found all the waterholes long before we did. Not a drop was really drinkable, and we were glad to use our daily malaria preventive (quinine) to remove its foul taste from our mouths.

MEAT HOLIDAYS FOR PORTERS

We were able to supplement our food supply in the villages, for cattle, sheep, and goats were plentiful in this region. Thus we provided our porters meat—a real holiday treat to them. Of course, we could not carry fresh meat along with us, but often when bargaining for an animal we would specify that it should be delivered to us a half-day's march ahead. So we would be accompanied by a native—sometimes a man, sometimes a woman—who would lead the animal and care for it until we were ready to slaughter it.

Often, too, our porters were able to buy sweet potatoes and *balaza* (manioc root) from the natives along the way. This root, from which a tapioca is made, when roasted over the coals is to many of the Malagash the finest food obtainable. Late one afternoon I made the mistake of inquiring *"Mish balaza tsara?"* (Is manioc good?) The emphatic answer, given by all eight porters in unison, was uttered too quickly for my ears to catch, but the meaning was clear: "Oh, sir, don't torture us by speaking of manioc when we are so hungry!"

As we skirted the shores of Tsimanampetsotsa, a shallow lake some 10 miles long and a half mile wide, whose salty, milk-white waters were undrinkable, and therefore considered poisonous, our porters eagerly gathered bits of clay and wood. These they treasured carefully as good-luck charms. Later I was able to purchase from one of my men what he claimed to be an especially powerful piece of dried mud. To cure any ill, he explained, one had but to paint the face with this potent clay and immediately his malady would vanish.

Whatever our hardships in the desert, we found compensation in its wonderful plant life; for this traveler's hell is just as surely a botanist's paradise. So abundant were the plants in this region that in most places it was impossible to penetrate the dense thickets, and we could move only along cut paths.

Photograph courtesy French Colonial Office

WOMEN FOLLOW FIRESIDE PURSUITS IN THE OPEN

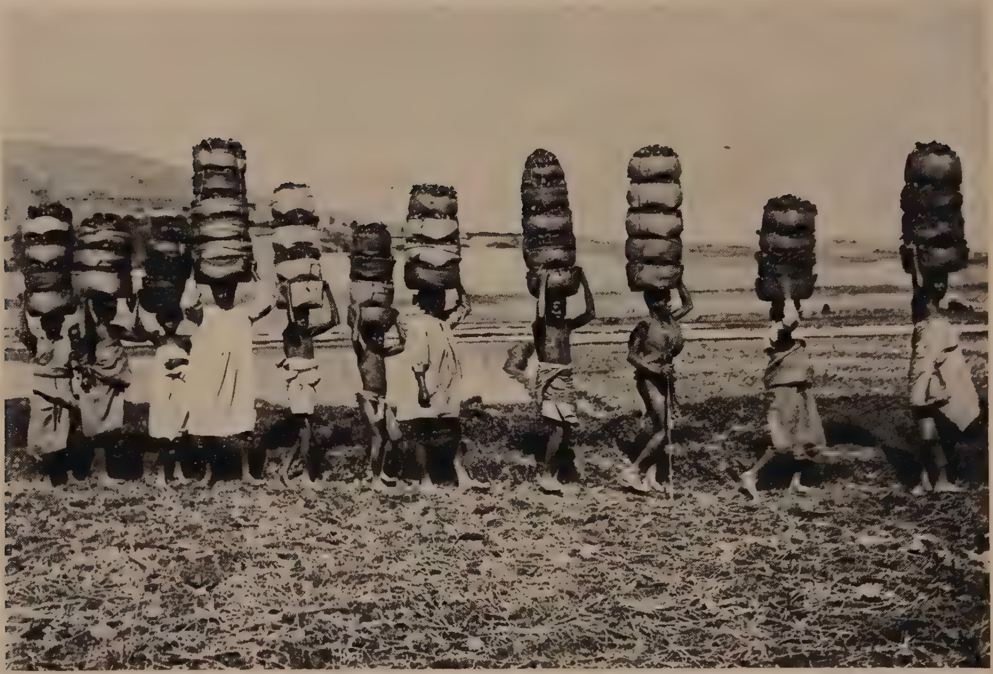
The game in progress here is *karatra,* a favorite pastime of the Malagash. It is similar to checkers and is played on a board of 32 holes, with seeds or pebbles for "men." Native houses, because of their low entrances and lack of light, are used for little more than sleeping and cooking. Hat-making and kindred household arts are practiced out of doors.

The beauty of the many ornamental plants was in striking contrast to the severity of their surroundings. The brilliant red and orange blossoms of the Kigelia tree, the intense crimson of the hibiscuslike Megistostegium, the stocky cactuslike elephant's-foot, with its beautiful white or yellow flowers, the succulent multicolored leaves of the Kalanchoes—all did their best to soften the harshness of the desert plains.

Less beautiful than these gems of the desert, but no less interesting, were the squatty bottletrees, 10 feet thick and only twice as tall, which had an air of solidity and permanence about them not shared by the frail grass huts of the natives of this region (see illustration, page 205).

Even though we were able to travel for the most part on paths already cut, our barefoot porters often found walking very difficult because of the thorns of the pricklypear, a plant which long ago found its way to Madagascar from America.

Most of this south country, unlike the rest of Madagascar, is flat. The records are meager, but it is known that much of this region has an annual rainfall of less than 10 inches, and half of each year is entirely without rain. Droughts of six years' duration have been known to occur. So it is only plants able either to utilize



Photograph courtesy French Colonial Office

CHARCOAL-CARRIERS HANDLE ENORMOUS LOADS

Because of the almost complete destruction of what were once wonderful forests over much of Madagascar, the city dweller must be supplied with fuel brought over long distances. The head is always preferred for burdens borne by individuals. When porters work in teams of two, they rest the weight on their shoulders (see illustration, page 199).

dew from the air, or to store enough water within themselves to last from one rain to the next, which can live here.

LINK-SAUSAGE ROOTS FILLED WITH WATER

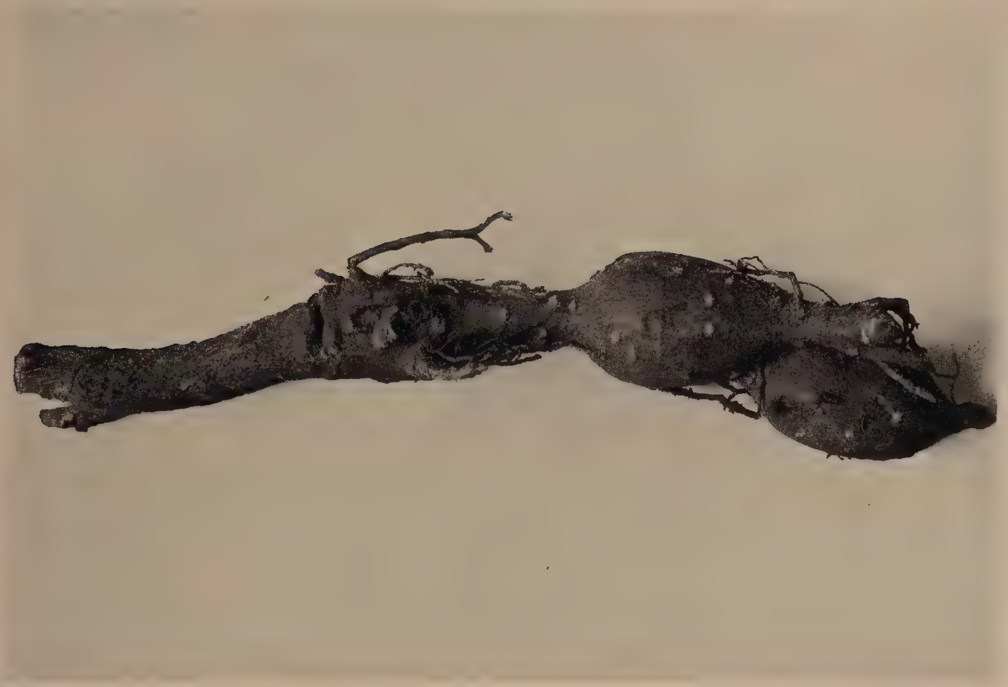
The real botanical prize of the expedition we found only in the south. Several years before the French occupation of the island, *Euphorbia intisy,* a plant yielding an exceptionally high quality of rubber, was discovered. Its collection by the natives was so ruthless that virtually every plant of rubber-bearing size was exterminated (see pages 198, 203, and 205).

No serious attempt was ever made to grow this valuable rubber plant in plantations, and even botanists acquainted with Madagascar feared that it had become extinct.

Consequently I was overjoyed when, after passing many weary miles and after having my hopes built up many times only to have them dashed to earth again, on the 16th day of our filanzana journey, I actually discovered this peculiar plant. It was growing on rocky soil which apparently had no water in it at all, but on digging up specimens to carry back with us we found that the roots possess an absolutely unique water-storage system.

They reminded me of a string of thick link sausages, each swelling being filled with almost pure water. Though not so good as that held in the leaf bases of the traveler's tree (see page 183), the water is even more appreciated by the traveler; for here, in this extremely arid land, thirst far more acute than is experienced in the humid regions, where the traveler's tree thrives, can be quenched. I ate these Intisy roots on several occasions, and while they could not be called delicious, they were at least "wet" and of better quality than the water we had been drinking.

Though our porters were willing to carry a filanzana or a load of baggage all day without grumbling, digging plants out of this extremely hard ground was such a difficult and unusual task that they



Photograph by Robert Taylor

LIVING INTISY PLANTS CAME SAFE TO WASHINGTON

The swellings on the root hold a supply of water which enables it to live in soil completely dry for six months of every year. In addition to the lot brought to America, the author collected specimens which he left at the botanic gardens in Tananarive, Marseille, and Algiers.

were soon showing me the blisters on their hands and trying to persuade me that the job was out of the question. It was only by promising each man the unheard-of wage of 40 cents for his day's work that I was able to get the number of specimens that I desired.

The whole southern section of the island, particularly that in which I found Intisy, is similar to our own Southwest. This allows us to hope that *Euphorbia intisy* will prove a profitable rubber producer in parts of Arizona and California.

On the last day of our filanzana journey our porters needed no alarm clock to awaken them. At 3:30 they were up and busy arranging their loads. In fact, when we reached Ampanihy, about noon, we had traveled 25 miles—one of our longest day's marches.

Here we parted company with our faithful porters, for we were back on the automobile road leading to Fort Dauphin. The fact that none of our porters had deserted us I attribute more to their docility than to the threat of imprisonment they had received before setting out. Jail in Madagascar means little, so far as a native's social status is concerned. The free food and lodging provided far outweigh the stigma of the large "P" sewed on the malefactor's shirt.

On the whole, they were a good-natured lot. Many times it was necessary to reprove them for singing and laughing all night long. Whenever we passed through communities unfrequented by travelers, the villagers would join, and there would be no let-up in the hubbub until early morning.

I asked some of our men what they expected to do with the two dollars or so each had received during this trip. "Pay my taxes and save what is left for buying cattle," was the almost uniform response.

NO EARLY PROSPECTS FOR AUTOMOBILE SALESMEN IN MADAGASCAR

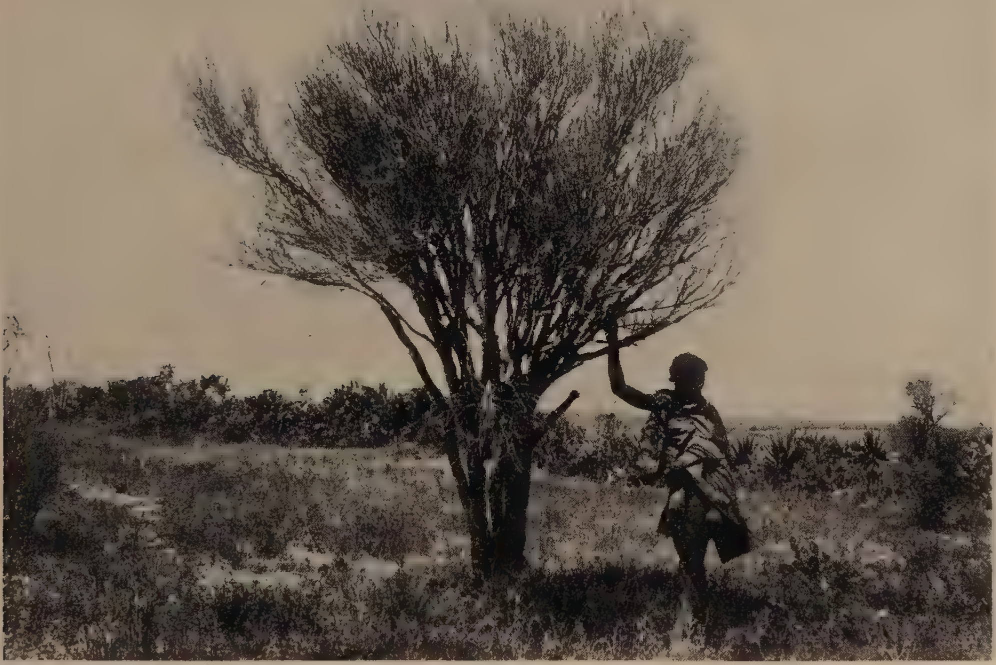
We had to send to Tuléar for our truck, the same one which had left us at the edge of the brush nearly a month earlier. During the week we waited for

THE TRAVELER'S TREE HAS MANY USES

In the base of each leaf stalk is an ever-ready supply of fresh, cool water that is always welcome to the traveler, and the broad fronds are used as dishes from which the natives eat their rice (see text, page 183).

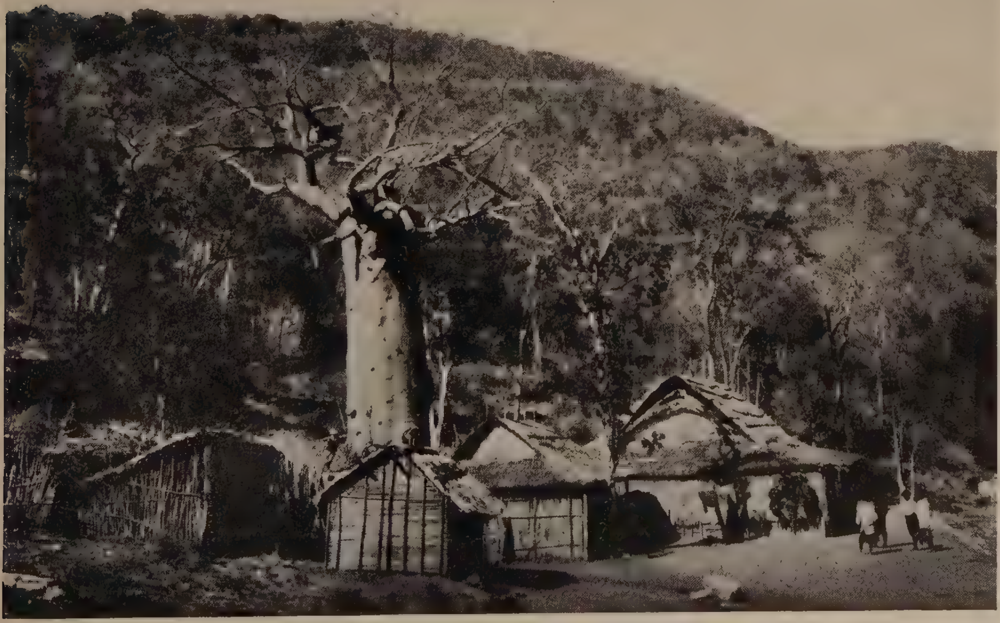
TREE EUPHORBIAS OCCUR IN ABUNDANCE IN SOUTHERN MADAGASCAR

If the American milkweed grew to the size of its close relative, the tall specimen shown here, the farmer would have to toil harder than he does now.



EUPHORBIA INTISY WAS THE REAL PRIZE OF THE EXPEDITION

This plant, formerly common in Madagascar, is now almost extinct. The high value of the rubber which the tree yields so excited the cupidity of the natives that they practically exterminated the species in their ruthless exploitation (see text, page 202).



BOTTLETREES GROW 10 FEET THICK AND 20 FEET HIGH

The hollow trunk of this baobab is used as a community storehouse. The wood is pithy and valueless. The man leaning against the tree provides a "yardstick" by which to judge its size.

INTISY PLANTS ARE RARE AND HARD TO FIND

It was only after torturous travel over hostile deserts in southern Madagascar that the expedition came upon the real prize (see text, page 202), which is seen here (center) in its native habitat. At all times its slender, dark-green shoots are practically leafless.

TO THE MALAGASH, MANIOC SEEMS MANNA

This root, a favorite delicacy among the natives (see text, page 200), is eaten raw, boiled, or baked, and a sort of tapioca is made from it. In taste it is much like the potato.

THE LEMUR MAKES A DELIGHTFUL PET

Natives are fond of these sprightly little fellows, which they call *mackies.* The animals are so plentiful in Madagascar that the island was once known as Lemuria.

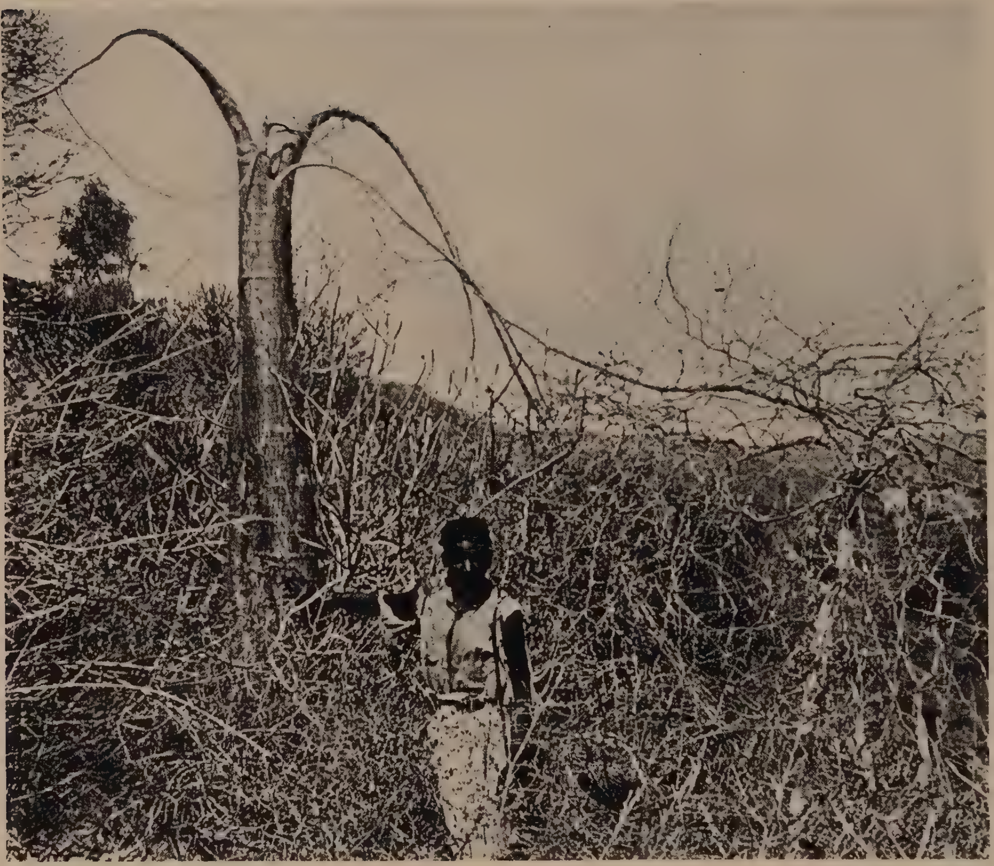
it in Ampanihy, not one car passed through the town, despite the fact that it lies on the only motor road crossing Madagascar from east to west. With the natives earning only 10 or 12 cents a day, it will be a long time before "term-purchase plans" will mean anything in the lives of the Malagash.

Here in Ampanihy I met one of the few Frenchmen in Madagascar who speak English. His seven years in this community he summed up indirectly in this remark: "I never write home now except on post cards. The climate is always the same, the people the same, everything the same, and it would be necessary to invent lies in order to write a letter; hence I stick to post cards."

One day we found a large tortoise not far from the village, and as we were dining with our English-speaking friend, we sent it to him as a present. We learned later that we nearly disrupted his household, for not one of his servants would kill it. The bad luck which would surely visit them if they should take this life was much more real to them than any of the bribes that were offered. Finally it was necessary to get a person outside the household to do the killing, after which the curse was off and the cook was perfectly willing to prepare the soup.

In Ampanihy I met a man who had been in Madagascar longer than any other white person I saw during my trip. He was an engineer, reared in England, who had spent 37 years on the island, almost all of it in the south. He it was who called my attention to an interesting story, first published in 1728—a tale as thrilling as our own "Robinson Crusoe." It is the journal of Robert Drury, an Englishman shipwrecked on the south coast of Madagascar in 1702 and held a slave in the southern region of the island for 15 years. Most of this time was spent not far from Ampanihy. Undoubtedly this weird tale has a large basis of fact, for no one could have imagined all that his journal contains.

A few hours after leaving Ampanihy we came upon one of the most dangerous stretches of road we had encountered. We had to ford the Menarandra River at



EVEN GRAPEVINES IN MADAGASCAR ARE QUEER

This Vitis, with its thick, hollow trunk, bears little resemblance to its more civilized cousins, and its fruit is not edible. Like the bottletree (see page 201) and other desert plants, it collects and keeps its own supply of moisture.

one of the most treacherous crossings in Madagascar. Natives from the near-by village, men and women, turned out to assist, and together we managed to push and pull our heavily laden truck across the stream and up the steep embankment on the other side.

We never failed to arouse great curiosity whenever we halted. As we first drove up to this stream and stopped at the water's edge, a dozen women ceased their work and collected in front of the truck to watch. I turned the movie camera on them and released the automatic spring. This seemed also to release the women's feet, for three seconds later all had run pell-mell into the water.

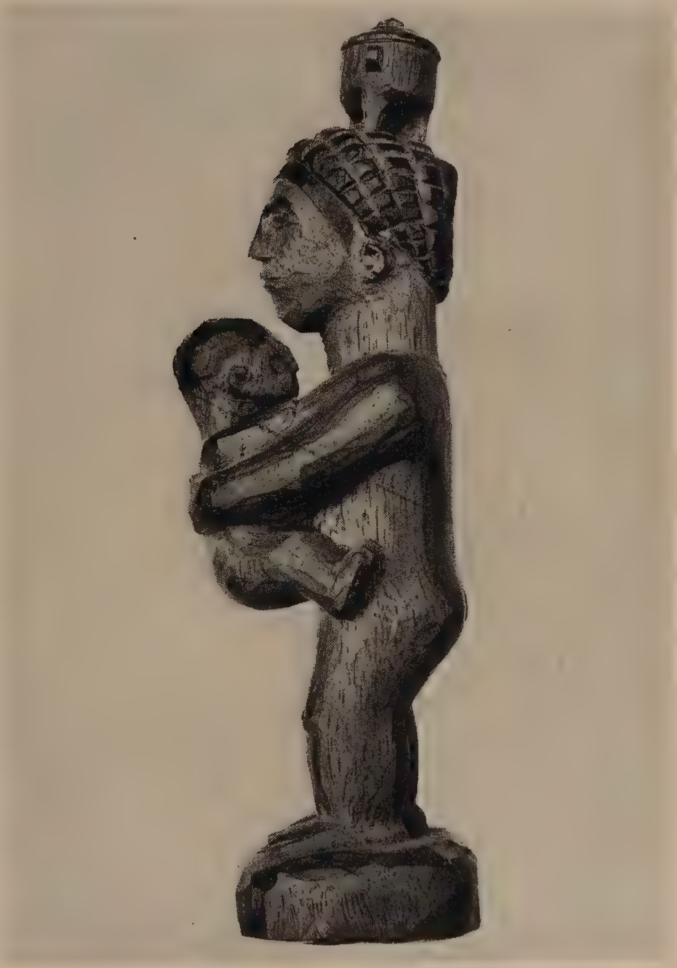
As we approached Fort Dauphin we entered the range of mountains which separate the brush of the south from the evergreen forest region of the east. Fort Dauphin, the seat of one of the first attempts at colonization made in Madagascar, was the end of the trail.

One winter's night, in my gay college days, I did a tedious job of chauffeuring for some returned missionaries, and as I walked home at 1 o'clock in the morning, leaving my automobile stuck in a snow bank, I firmly swore that I was "off" missionaries for life. Little did I think then that I would visit an American mission more than 10,000 miles from home. It is needless to say that, after spending months in a land where I could speak neither the language of the natives nor that of the colonial administrators, I appreciated the hospitality of the missionaries whom I found with headquarters here in Fort Dauphin.

Twenty-nine families of these American missionaries are stationed here in the south, their missions scattered throughout the entire territory. All are from Middle Western States and all are of Norwegian descent. They work in close coöperation with the Old World Norwegians, who have a number of missions throughout central Madagascar.

Several of these Americans have been here in the south for more than 30 years. These gospel pioneers were far too progressive to accept without a struggle the hardships and deprivations which they faced in this far-off land.

To do their best work, they realized that they must have decent living quarters and efficient means of transportation. I dare say that the comfortable homes, the automobiles and motorcycles which now form a part of their regular equipment—in short, the efficient manner in which these missionaries go about their daily tasks—make their teachings more than idle words to the Malagash.



Photograph by Robert Taylor

MAHAFALY WOOD-CARVING IS MODERNISTIC

A touch of realism is added to this figure of a woman by the representation of the indispensable iron kettle poised on her head. The hairdress is typical. Such "permanent waves" are kept in place by a thick coating of tallow (see, also, page 191).

These missionaries are by no means confining their efforts exclusively to religion. Classes in reading and writing, lectures on sanitation and health, demonstrations in many sorts of industrial work, are part of their daily schedule. The French recognize that they have had a great influence in establishing order in this part of Madagascar.

Two trips into the forests of the mountains overlooking the coast yielded me abundant moss for packing material for my plants. Here I tried to obtain pictures of the lemurs so often seen in Madagascar; but, like the natives, though very curious, they were afraid of my camera and I was unable to get close enough to take any good pictures of them (page 207).

From the hilltops we could see the lagoon just back of the shore line, where the rivers and the sea are fighting for supremacy. Often, I was told, it is possible to witness a more personal aspect of this fight, a life-and-death struggle between a representative of the sea, a shark, and of the river, a crocodile.

When I sent my chauffeur to obtain gasoline for our return trip north, he came back telling me that gasoline was *"tsy mish."* A search on my part, including an appeal to the chief administrator,

Photograph courtesy French Colonial Office

NATIVES TAKE PRIDE IN THEIR MONUMENTS

Often the Malagash devotes more time to preparing his tomb than to building and improving his house, for he reasons that he will pass a much longer time in the former. The man shown here wears a "coat" which once saw duty as a gunny sack.

but confirmed my chauffeur's report. It seemed I was doomed to wait two weeks, until a boat should arrive bringing gasoline. But I had accomplished the aim of my trip; for, in addition to the 1,500 different herbarium specimens I had helped Professor Humbert obtain, I had collected more than 100 lots of seeds and plants, including 23 rubber producers and many fine ornamentals, all potential additions to American agriculture. Thus I had all the plants I could handle on the return journey. Moreover, I had awaiting me a family on the other side of the world.

This stirred me to further action and led me again to the American missionaries, and once more with fruitful results. Hence, on September 18, I bade farewell to Professor Humbert and set out with my chauffeur in the familiar truck to make connections with the public bus, 400 miles to the north.

My chauffeur had asked that his brother, also a chauffeur, be permitted to accompany us. Since our trip lay through country devoid of gas stations or garages, I was only too glad to consent. I was more surprised than pleased, however, when, five hours later, lifting up the curtain behind the seat of the truck, I discovered two other passengers smuggled in by my chauffeur—one of them a 16-year-old Hindu girl.

AN 8-DAY JOURNEY IN ONE

In spite of our extra passengers, we traveled 250 miles on this first day out of Fort Dauphin, for we found the road, opened only a few days before, to be the best in Madagascar. I shall never forget the gasps and profound admiration which we elicited from the natives who helped us over our last bad river crossing that night. The fact that we had made this 8-day journey, judged by filanzana standards, in one day excited great wonder. In fact, to them this was a feat fully as remarkable as Lindbergh's famous flight was to the rest of the world.

Fortunately, I made prompt connections with the bus, and with my bulky cargo of living plants we journeyed to Tananarive.

To have been killed in a public bus in

BACK IN WASHINGTON, THE AUTHOR EXAMINES HIS PRIZES

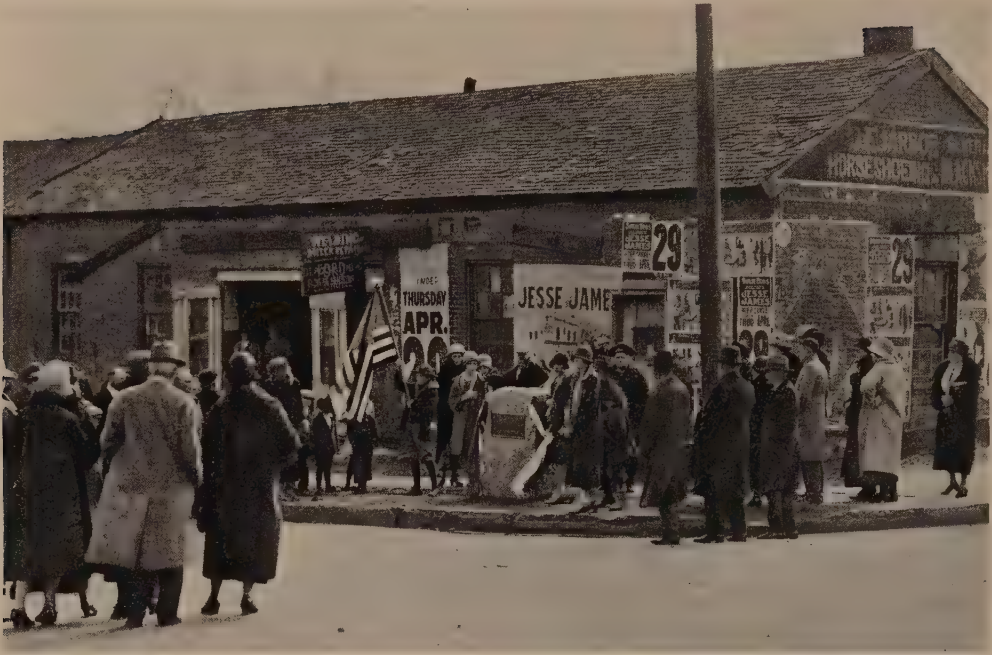
Intisy rubber plants are now thriving, far from their native soil, in the United States Department of Agriculture greenhouses. Specimens have been sent recently to stations in California and Florida. In these two States and Arizona it is hoped they will find ideal conditions for growth (see text, page 203).

Madagascar would, to say the least, have been prosaic; for here malaria, plague, leprosy, thirst, hurricanes, crocodiles, and other picturesque means to an end are available. Nevertheless I thought this was to be my fate when the steering rod of our machine broke and we wobbled perilously on the edge of a precipice. Except for this mishap, my trip to the capital continued without incident. In four and a half days I completed what is generally considered a three weeks' trip.

A day's train trip to the port, numerous details, such as getting my precious cargo on board ship, a few days of cruising along the coast, and Madagascar lay behind.

Seven weeks later I stepped ashore at New York. I doubt whether anyone ever walked down the gangplank of a first-class ocean liner with such a queer assortment of baggage as I. Conspicuous among the luggage of travelers from the Riviera were my eight miniature greenhouses and my battered trunks and suitcases, my awkward canvas bags and gunny sacks; yet far more precious in my eyes than the finest jewels which my fellow passengers brought with them was the living plant material which made up my unsightly array.

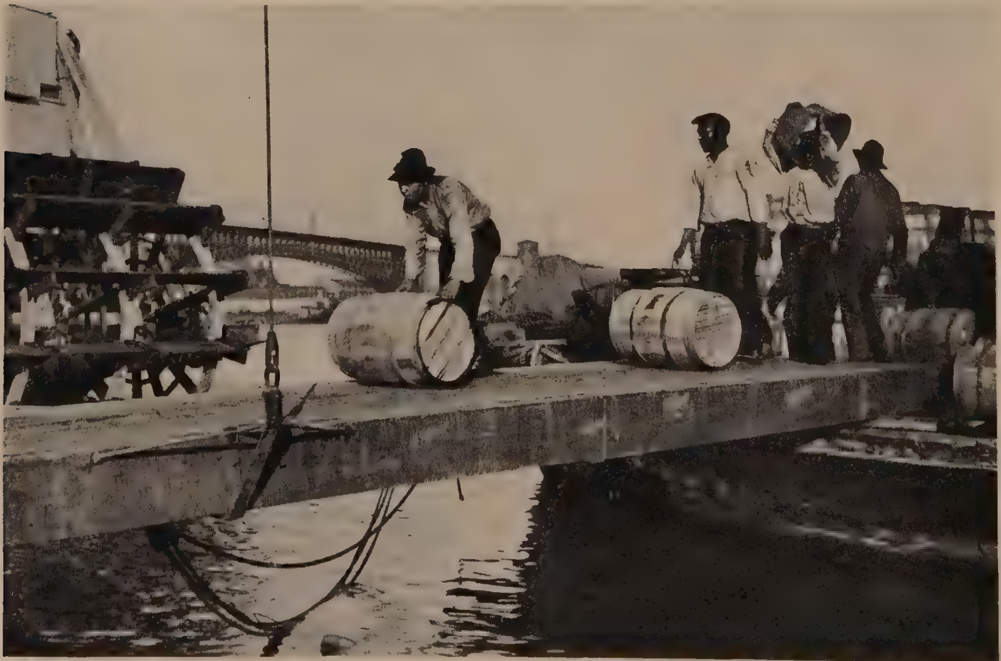
More intangible, but no less precious, are the memories I brought home from the strange land of Madagascar. Back in the pell-mell rush of the New World I pause, not to sigh for a return to the slow-moving life of the island, but to wish for a bit of the time which daily goes to waste in Madagascar.



Photograph from Grinter's Studio

IN THIS PIONEER BLACKSMITH SHOP OXEN AND MULES WERE SHOD A CENTURY AGO

Stages and ox-wagons halted for repairs here beside the Old Trail in Independence, Missouri. Daughters of the American Revolution dedicated this Trail marker three years ago (see text, page 217).



Photograph by C. P. Cushing from Galloway

ROUSTABOUTS UNLOADING BARRELS FROM A STEAM PACKET AT ST. LOUIS

For a time after Lewis and Clark, pack mules used the Boone's Lick Road from St. Charles, near St. Louis, up the Missouri River as far as Franklin. When steamboats came they carried freight to Franklin and beyond for transshipment to the Santa Fe Trail Over this road passed many of the pioneers into the country west of the Mississippi.

THE SANTA FE TRAIL, PATH TO EMPIRE

By Frederick Simpich

Author of "Arizona Comes of Age," "Missouri, Mother of the West," "So Big Texas," etc., etc., in the National Geographic Magazine

"I WILL pay 1¢ for the return of the apprentice, Kit Carson, who ran away from my harness shop in Franklin, Missouri. . . . He is 16, small for his age, and has light hair. . . . David Workman."

One day in 1826 that notice, in substance, ran in the *Missouri Intelligencer,* printed in the carousing pioneer river town whence Kit had fled.

But Kit never went back—to the harness shop. Instead he joined the wagon trains for Santa Fe across the Plains. High adventure called then. America was in the making. Twenty States were yet to be carved from the vast, mysterious, unmapped world beyond the Mississippi. Who could sit astride a saddler's bench and ply an awl when fur traders were conquering half a continent and battling whites deemed it only fair to "lift the hair" of fallen Indian foes!

No wonder Kit Carson and others of his kind quit the workbench, the field, and forge to trap beaver, shoot buffalo, and scalp Indians on the long trail into the setting sun. Even then, 100 years ago, man's increasing control over Nature was making him independent of geographic obstacles. Prairie schooners steered by compass. Mexico, freed from Spain, was eager for Yankee goods. Over the long Santa Fe Trail commerce had already begun. St. Louis traders, braving the unknown, hauled calico and tools overland for 1,600 miles, for sale at Chihuahua. Men got rich on one round trip.

A BIG PARADE OF THE GREAT

In all the world, never such a path to empire!

Across a virgin land it stretched, a hard, hoof-worn highway, often 100 feet wide, so beaten and packed that for years afterward it couldn't be plowed, and with not a white settlement on its whole savage-haunted length. On buffalo meat alone the plainsman often lived, and from green hide he made clumsy, sacklike boots to save oxen feet from stones and hot sand. Fifteen miles was a good day's march.

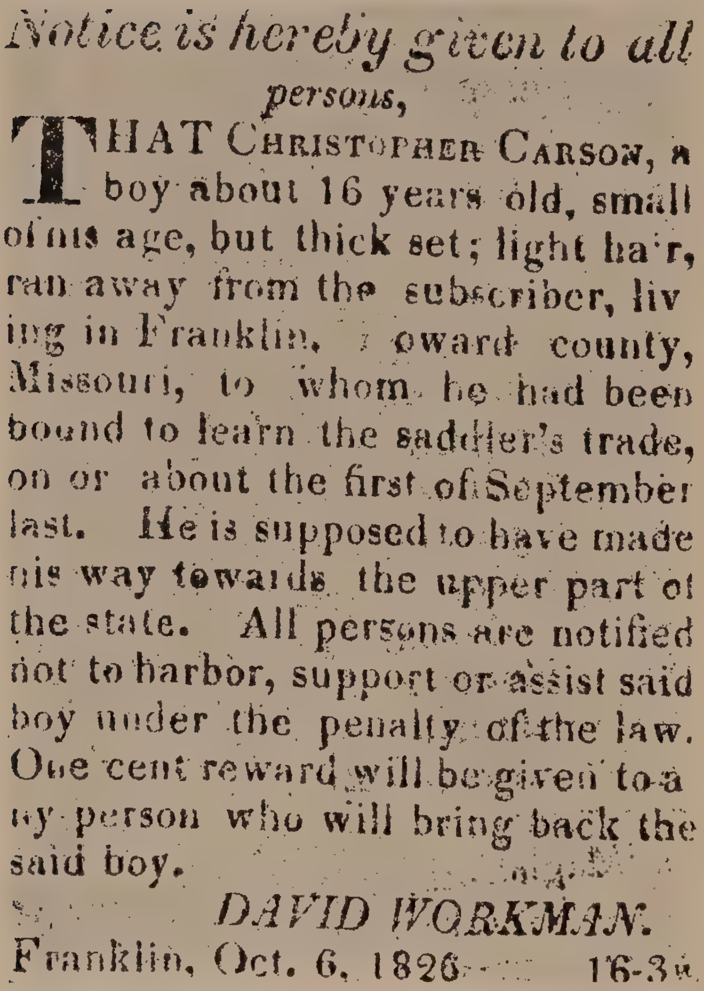
Pike passed this way to find the Peak, to be made captive and imprisoned at Chihuahua, and to picture with singular, prophetic accuracy that vast commerce which was one day to arise with Mexico. Frémont, the Pathfinder, came, and Stephen Kearny, to conquer California; and Buffalo Bill, Crook, and Miles, Hancock, Sherman, Sheridan, and Greely; Calamity Jane, Wild Bill Hickok, and Henry M. Stanley. A Big Parade truly, and in it Custer, the Curlyhaired, slain with his Seventh Cavalry troopers that fateful June day on the Little Horn.

And over this amazing pathway of the Plains drove the longest wagon trains the world ever saw, trains often miles long, with four and even eight creaking wagons rumbling abreast. What a colossal traffic it was, pushing out to win the West! At its peak, 3,000 wagons and 50,000 ox yokes used in one season!

WHEN FRANKLIN SEETHED WITH EXCITED MEN

Franklin, in Kit Carson's youth, was the outpost of civilization. St. Louis, with 4,000 people, was the only other large town in Missouri. From there clumsy boats, battling sand bars, snags, and muddy whirlpools, their passengers often firing at deer or wild turkeys on the wooded river banks, beat upstream to Franklin, where the Santa Fe Trail then started.

Franklin boomed with the fur trade. It fairly seethed with excited men. Oxen bawled; mules kicked and grunted. Through mud and dust of the crude town's crowded streets creaked heavily loaded wagons of Conestoga type, canvas-topped, schoonerlike wagons, loaded with bolts of calico, ginghams, velvets, cotton goods, cutlery, firearms, tools, and light hardware, and drawn by four or five pairs of oxen or mules; and, breasting this westbound stream, up from Santa Fe, from El Paso, even from far Chihuahua, pack trains came drifting in, laden with Mexican silver, with beaver plews and buffalo robes. Big-hatted, swarthy "Spanish" men in red



Notice is hereby given to all persons,

THAT CHRISTOPHER CARSON, a boy about 16 years old, small of his age, but thick set; light hair, ran away from the subscriber, living in Franklin, Howard county, Missouri, to whom he had been bound to learn the saddler's trade, on or about the first of September last. He is supposed to have made his way towards the upper part of the state. All persons are notified not to harbor, support or assist said boy under the penalty of the law. One cent reward will be given to any person who will bring back the said boy.

DAVID WORKMAN.

Franklin, Oct. 6, 1826. 16-3w

AN ADVERTISEMENT IN THE FRANKLIN "MISSOURI INTELLIGENCER"

Scout, fur trader, pioneer in the conquest of the West, brigadier general in the United States Army—such was the brilliant destiny of Kit Carson, for whom a reward of one cent was once offered! (See, also, text, page 213, and illustration, page 215.)

blankets and tight trousers—men who fought with knives and spoke a purring tongue strange to Missouri folk—mingled with returning caravans.

Sunburnt, long-whiskered traders and trappers in buckskins and moccasins came back from the West to brag of their adventures and scatter their quick-earned profits. They made the river bottom ring with nightly wassail, with rough-and-tumble fights. Their tall tales of treasure, of quick fortunes in beaver pelts, of boisterous fandangos and smiling señoritas in romantic Santa Fe, roused the envy of stay-at-homes.

One early Missouri trader, Capt. William Becknell, came back with a whole mule train loaded with silver pesos. When he dumped his money bags in a Franklin warehouse they burst open and money fairly covered the floor. Nobody had ever seen so much.

No wonder Kit Carson ran away!

Rich St. Louis bankers, stirred by news of big profits in the newly opened Santa Fe trade, rubbed elbows in Franklin with buckskinned mountain men and returning freighters. And in all men's mouths were new place names—Yellowstone, Columbia, Taos, Rio Grande. America was in the making. Seattle, Denver, San Francisco—they had yet to be built and christened. The Yosemite, the Grand Canyon, Salt Lake—the East had never even heard of them. Hardly a handful of white settlers then where millions now make their homes. Arizona, Nevada, California—their stupendous wealth of gold, silver, and copper was not even suspected.

FADING FRANKLIN, ONCE AN OUTPOST OF EMPIRE

Yet, in all the history of civilization, no region was ever to see such swift and amazing transition from wilderness to populous empire of richness and power. It can never happen again; no empty place is left on earth where it could happen.

To-day a speedy motor highway ties St. Louis to Kansas City. It sweeps through fading Franklin, where in Kit Carson's youth the Trail began. Over it parlor busses hum, running as far in 20 minutes as ox teams went in a day. Now men watch market reports or play golf where their forbears watched for Indians or tinkered with mink traps.

From a spot near where young Kit Carson stitched horse collars and bellybands a big highway bridge leads off to span the Missouri. Here busses and motor tourists stop for gas. Men get out to stretch their legs or buy a ginger ale. Across the Big Muddy stands Boonville, named for Daniel, whose sons whittled ramrods from Missouri hickory and made salt from the deer licks, packed it in hollow logs, and floated it down to St. Louis.

Far outpost of empire Franklin was in those exciting days. It saw the cheering legions pass. But now its symphony of life is lulled. Long ago the hungry river claimed most of it.* Few, indeed, of the hastening host who pause now for hot dogs or cigarettes even dream what stirring scenes were staged here when the Mexican flag still waved from western Kansas to California.

Yet its name, like Daniel Boone's and Kit Carson's, endures in the annals of the West.

CHRISTOPHER CARSON

Photograph by O. E. Aultman

BRONZE EQUESTRIAN STATUE OF KIT CARSON AT TRINIDAD, COLORADO

From saddler's apprentice to Indian scout, Army officer of high rank, and great leader conspicuous in the conquest of the West—such was the remarkable career of the man for whom one cent reward was offered (see page 214). His name and fame are forever linked with the Santa Fe Trail.

As for the Trail itself, sweeping on from the Big Muddy to ancient Santa Fe, now it is busier and better than ever. Railroads and motor highways, paralleling its course, handle to-day's vast commerce. Now millions ride in speed and safety where pioneers beat their stubborn way against thirst and hunger, daring torture and death in the forays and ambuscades of Pawnees, Kiowas, Cheyennes, Comanches, Osages, and Arapahoes.

Where millions of buffalo rocked the Plains with the thunder of stampeding hoofs and died from arrows, spears, and

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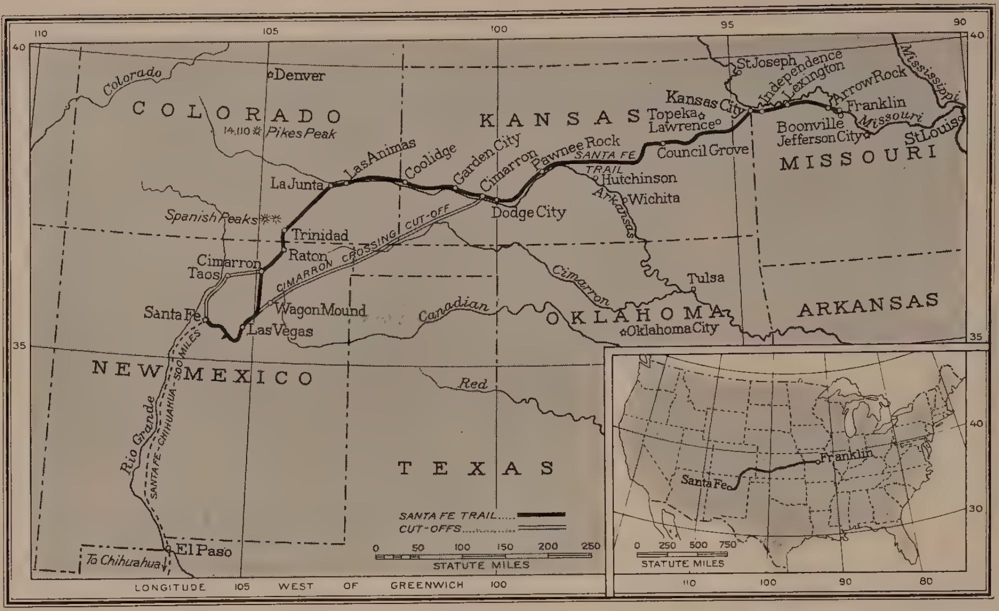
* See, also, "Trailing History Down the Big Muddy," by Lewis R. Freeman, in the NATIONAL GEOGRAPHIC MAGAZINE for July, 1928.


COLORADO
KANSAS
MISSOURI
OKLAHOMA
ARKANSAS
NEW MEXICO
TEXAS
Denver
Pikes Peak
La Junta
Las Animas
Coolidge
Garden City
Cimarron
Pawnee Rock
Dodge City
Hutchinson
Wichita
Council Grove
Topeka
Lawrence
Kansas City
St Joseph
Independence
Lexington
Arrow Rock
Franklin
Boonville
Jefferson City
St Louis
Trinidad
Raton
Cimarron
Taos
Santa Fe
Wagon Mound
Las Vegas
Tulsa
Oklahoma City
El Paso
To Chihuahua
Spanish Peaks
SANTA FE TRAIL
CIMARRON CROSSING CUT-OFF
SANTA FE-CHIHUAHUA-300 MILES
Rio Grande
Red
Canadian
Arkansas
Missouri
Mississippi
SANTA FE TRAIL
CUT-OFFS
STATUTE MILES
LONGITUDE 105 WEST OF GREENWICH 100

Drawn by James M. Darley

THE PATH OF EMPIRE BLAZED BY THE SANTA FE TRAIL

From Franklin, Missouri, to Santa Fe, New Mexico, it cut across the Plains for a distance equal to the airman's route from New York to St. Louis.

rifle balls, now millions of meat-bearing animals lift bovine faces to stare at passing trains and motor cars—slow-moving, safe in fenced fields, chased by no wolves, Indians, or hungry white men on horseback.

Windmills, wells, city water systems—lots of water now where men wild with thirst once vainly dug with bleeding fingers in dry stream beds, or walked out on parched plains to lie down quietly and die.

A 96-year old freighter on this Trail was a friend of mine when I was a boy in Missouri. His favorite yarn concerned a white man who got knocked down and scalped, but who, by sheer luck, shot his Indian assailant and retrieved his own scalp. This he put in a bucket of water to keep it fresh and carried it four miles back to a village. But they couldn't make it grow fast again.

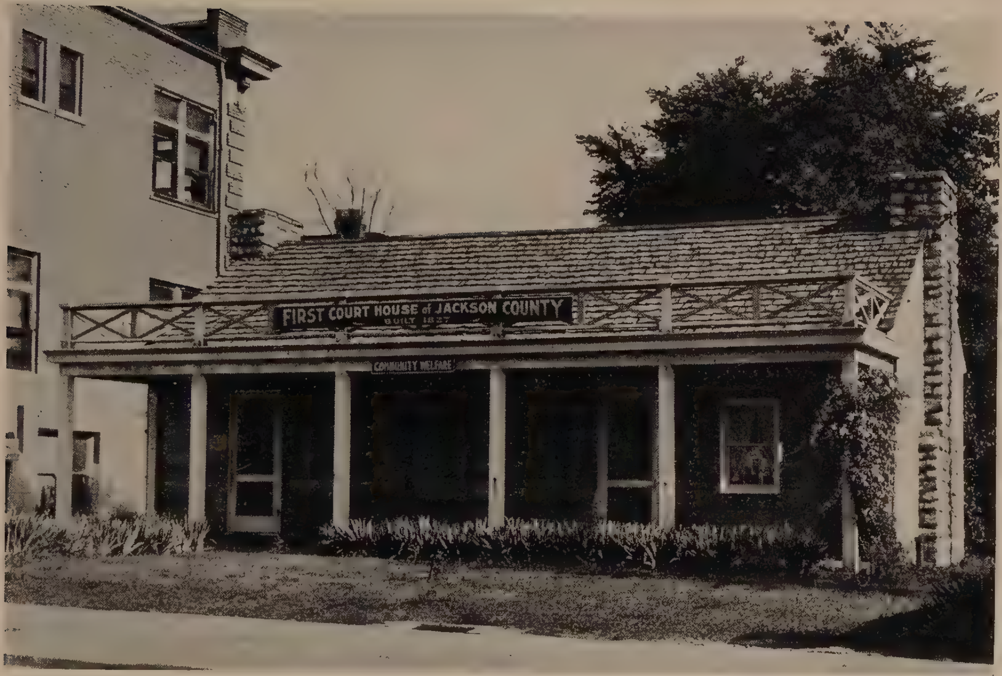
"Axle grease used to get so scarce," this veteran told me, "our dry wagon wheels squeaked and squealed like animals in a trap. Sometimes we didn't have even enough grease to rub on a mule's sore back to keep the flies off." Now Kansas yields oil, and pipe lines carry oil from Wyoming, across the Old Trail, and clear down to Texas—shiploads of it. Now motors stall where mules used to balk, and tires go flat where oxen went lame or got sick from "losing their cuds."

FROM WARPATH TO BEAUTY PARLOR

Kit Carson would find lots of changes, could he come back. "Lifting hair," as he called operations on the scalp, is practiced now only in the beauty shops of towns along the Trail. It is not easy now to trade glass beads or cheap firearms for hunks of virgin silver in Santa Fe; nor would the town cheer a mule driver arriving from Missouri or call a holiday should a drygoods peddler arrive.

The ancient tree-lined plaza, where pioneer freighters ended their long trip across the Plains and unloaded their big wagons, is still the center of life in Santa Fe. At evening time, when soft breezes sigh among the trembling elm leaves, the local señoritas, dark-eyed and flirtatious, promenade this ancient plaza and smile as ravishingly as in Kit Carson's romantic day. But none of them would leave home now for a red-headed beaver trapper, as Inez did in "Death Comes to the Archbishop," even if the trapper *had* licked every other rival at the fandango.

To see what life is like now along this



Photograph by Ewing Galloway

ONE OF THE OLDEST BUILDINGS IN THE MISSOURI VALLEY

This little two-room cabin of hewn logs was built in 1827 as the Jackson County Courthouse. It stands at Independence, Missouri, from which three great trails—the Santa Fe, the California, and the Oregon—led to the West.

100-year-old pioneer path, I followed it from Missouri to New Mexico.

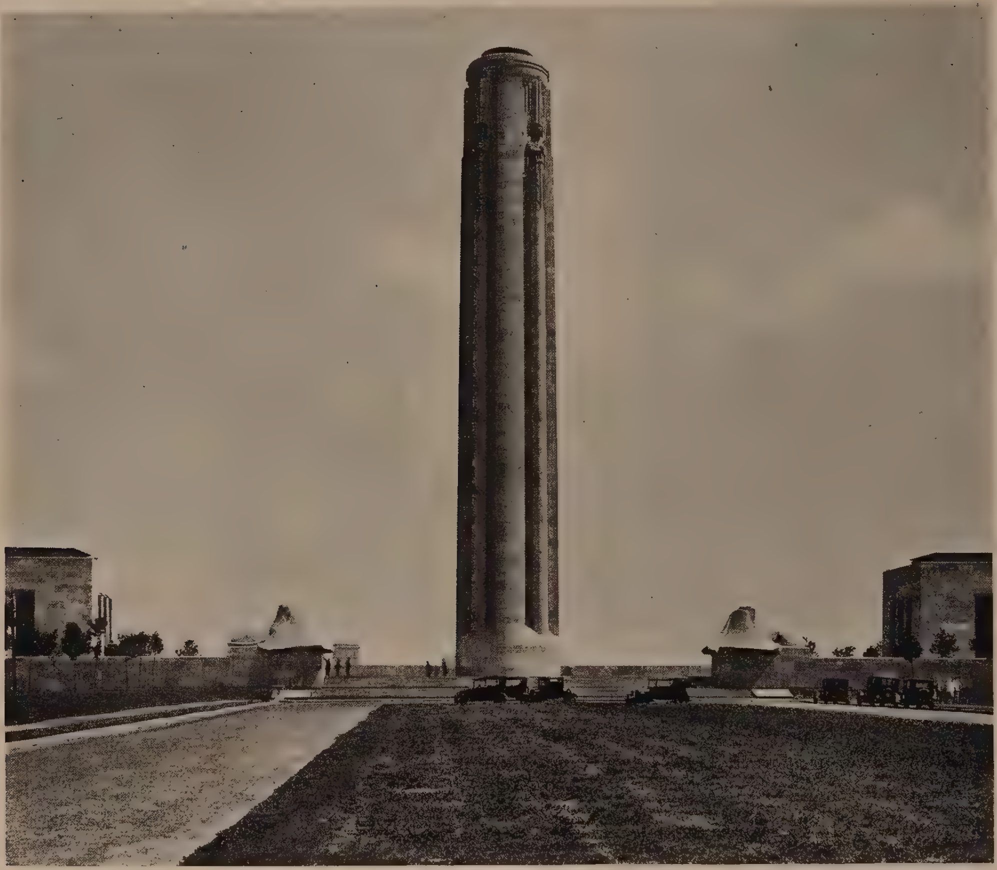
Originally the Trail ran upstream from Franklin, crossed the river at Arrow Rock, and stretched west through what is now Lexington and Independence, Missouri (see map, page 216). A rich region this, where, as settlers multiplied, a vigorous culture developed, with its familiar homemade walnut furniture, ash hoppers, big soap and sorghum kettles, looms, and spinning wheels.

THE FUNNEL FOR EARLY WESTERN TRAVEL

To-day, where Washington Irving saw myriad prairie chickens, or "parrokeets," as pioneers called them, one passes big pens of white leghorns. Endless "Old Trail" garages take the place of wayside blacksmith shops, where former pilgrims stopped to shoe a horse or set a tire. Where slaves tended hemp and tobacco, big dairy plants are busy now, their painted barns and silos replacing the weather-beaten tobacco sheds of other days. Descendants of the slaves are here, but dwindling fast, moving to the cities, as power machines free man more and more from farm drudgery.

As commerce grew, boats pushed farther up the Missouri, passing Franklin. By 1831 Independence became the starting point for traffic across the Plains. Plying the river then was one Government-owned boat used for exploring, the *Western Engineer*. An early narrative says: "In place of a bowsprit she has carved a great serpent, and as the steam escapes out of its mouth it runs out a long tongue, to the perfect horror of the Indians."

Independence, in its palmy days, was the funnel through which westward travel poured. From here went not only Santa Fe traders, but Mormon trains for Utah and the thousands of covered wagons for the long Oregon Trail to the Northwest. In "The Western Guide Book and Emigrant Directory" for 1849 is a rude map, showing all the great overland trails as starting from Independence, Missouri; but the big blank spots on this map and its meager details reveal how little we knew



Photograph from Roy Godsey

LIBERTY MEMORIAL TO THOSE GONE WEST

In memory of men dead in the World War, this shaft, simple yet powerful, rises high in Kansas City skies (see, also, page 219). Across the Old Trail, too, its shadow falls, honoring that other valiant host long ago "gone west" in the conquest of the Plains. On top of this monument, by a special device, an illusion of eternal fire is created.

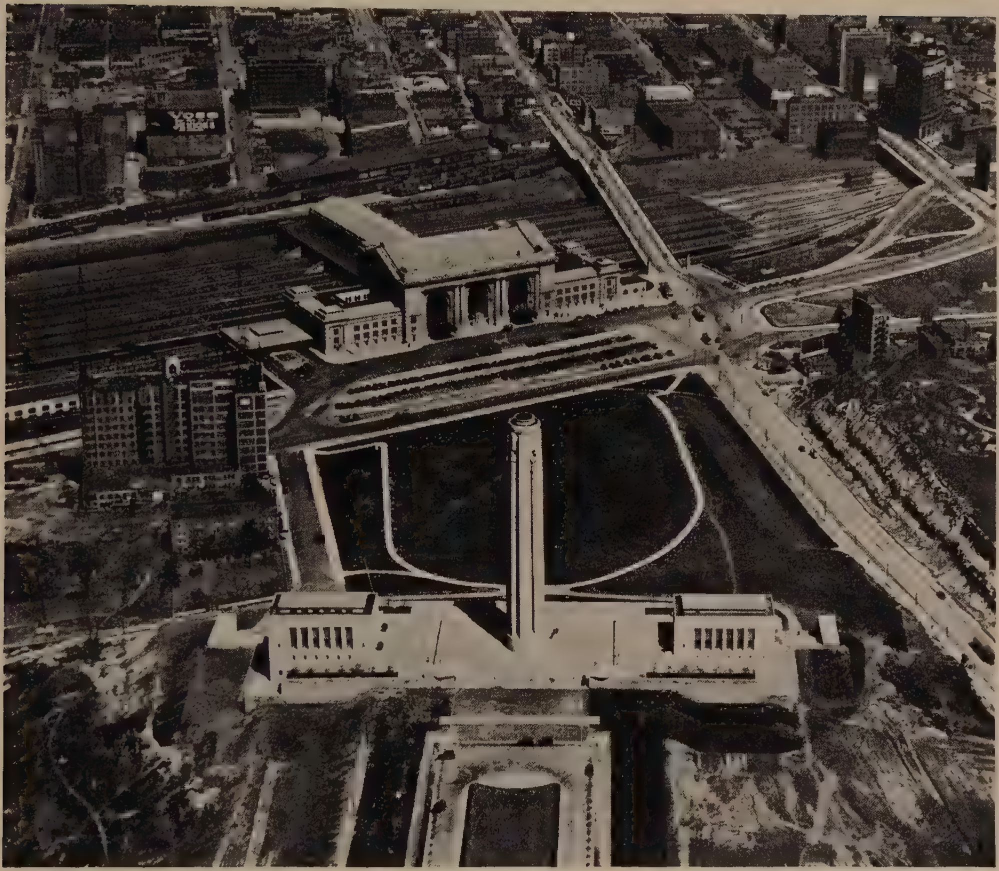
of our western country only 80 years ago. In the backyard of one pioneer Independence home, stored away in an abandoned barn, I saw an old stagecoach with leather springs. I got in and rocked it and tried to imagine how it might once have bounced over the Old Trail when chased by bandits or Indians. In faded letters on its side were the words "Western Overland Mail."

Copies of *The Western Expositor,* printed at Independence in the early 1840's, were shown to me there. The editor's motto was: "I have sworn upon the altar of God eternal hostility against every form of tyranny over the mind of man."

In this same paper was a description of Frémont's departure on his famous western expedition, and news of traffic and Indian fights on the Trail.

In another early newspaper I found signs that nature fakirs were busy even in pioneer times.

A singular fight between a hunter and a buffalo was described. The hunter, said the item, left camp with a pistol to shoot rabbits for an evening stew. At a moment when his weapon was empty a buffalo bull suddenly rose from a hidden wallow and charged. In fright, the hunter dodged; then leaped high in air to escape the lowered head of the charging bull. By sheer luck he alighted in the animal's long mane, astride its neck! There, holding with one hand, he used his other hand and teeth to load his pistol. Then, placing the



Photograph by Ewing Galloway

"K. C., CROSSROADS OF THE CONTINENT," BARTERS WITH THE PLAINS

In the foreground, towering above Union Station, rises the great stone World War Memorial. Dedicating it November 11, 1926, President Coolidge said: "It has not been raised to commemorate war and victory, but rather the results of war and victory which are embodied in peace and liberty."

gun against the big bull's ear, he fired, killing the buffalo and "escaping with only a bad fall."

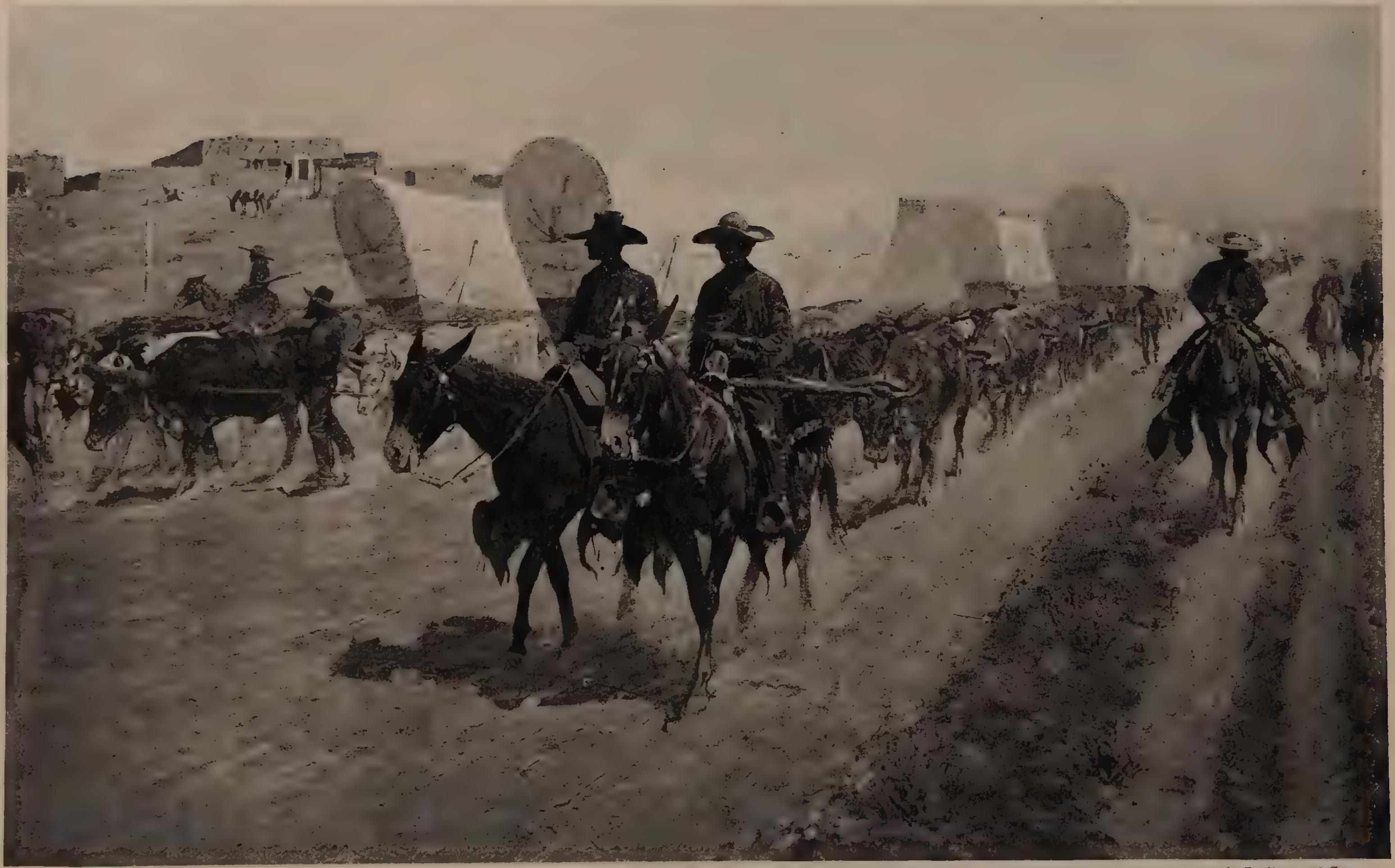
"K. C.," CHILD OF THE TRAILS

A few miles upstream from Independence Landing, where the Kansas, long called the Kaw, twists north into the Missouri, fur traders and freighters found a flat, shelving rock, an easy place to land goods. Near here, by 1833, a new town, Westport, came into being.

In time it became the starting point for Santa Fe. Gradually, as merchants and farmers followed the fur traders, this colony spread through a gap in the bluffs and came to be known as "Kansas," after the local tribe of Indians. Incorporated as the "Town of Kansas" in 1850, its name was changed to Kansas City in 1889.

"K. C." the natives called this crossroads of the continent, "whose God is Motion and whose ideal is Change." It is the child of the trails—a giant industrial child, rich now from barter with the Plains. For decades, facing what old geographies called the Great American Desert, it was the Nation's main gate to the Far West. Even yet it claims the lion's share of that now stupendous traffic which may still be styled the commerce of the Plains.

As railways pushed west, surveyors found that all grades slope down to the Missouri River bend where Kansas City stands. Railroad men say you can take a freight car 300 miles out west on any line



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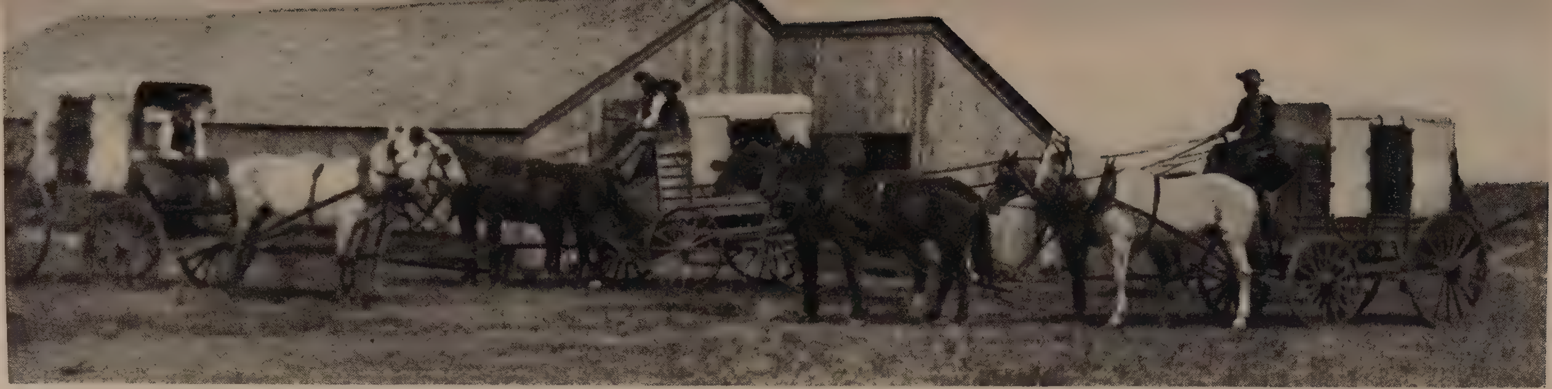
LIKE SLOW MOTION PICTURES, OX TEAMS CRAWLED IN CLOUDS OF DUST ACROSS THE PLAINS

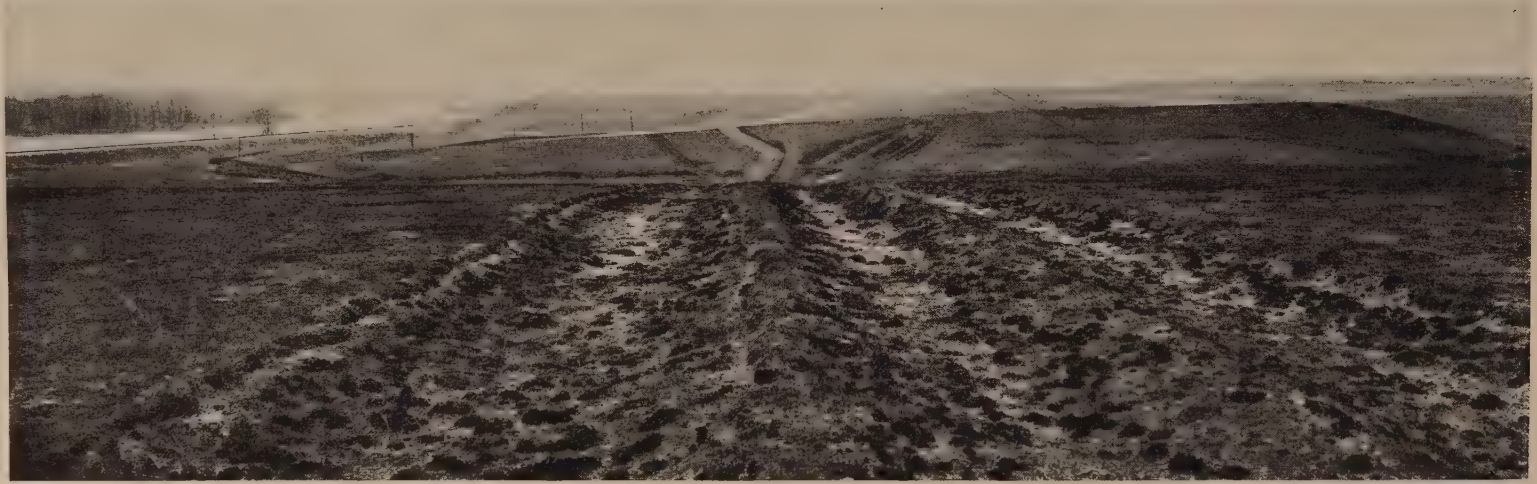
Two, four, and even eight abreast the wagons sometimes rolled, escorted by outriders for protection against Indians. "The Caravan on Its Way" is Frederic Remington's title for this remarkable study of the old West.



Photograph by H. F. Schmidt

DAWN IN DODGE CITY, LONG AGO, WITH STAGECOACHES READY TO START WITH MAILS AND PASSENGERS

Many stage lines issued arms to passengers for use against Indians and renegade whites who thrived as highway robbers along the Old Trail. On "Boot Hill," at Dodge City, 38 of these "bad men" were buried. Excavations there for a building, years later, revealed one early fighting man buried with guns and spurs on and an Indian arrow in his skull.



Photograph by L. Palenske

OVER SILENT, EMPTY PLAINS PLODDING EMIGRANTS POUNDED THIS PATH TO EMPIRE

The actual Santa Fe Trail, as it looks now, in the hills west of Dodge City, Kansas. Buffalo grass was burnt off before this picture was taken, leaving in plain sight the ruts worn by wagons and stagecoaches. In the left background is the Arkansas River, paralleled by a railway, and, winding toward the horizon, runs the white ribbon of the new Santa Fe Trail paved highway.

from Kansas City, let it loose, and it will coast back again. Now twelve trunk lines and twoscore branches serve it. Its trade is above a billion dollars a year and it slaughters about 7,500,000 animals. It has no iron ore at hand; yet, from old farm and factory machines gathered on the Plains, its steel furnaces consume more than 650,000 tons of scrap iron annually!

WHERE THE CURRENTS OF NATIONAL LIFE EBB AND FLOW

Here all the currents of our national life ebb and flow. Into a vast union station (see page 219) pours an endless stream of tourists, bound for Santa Fe, Los Angeles, San Francisco, Seattle, the Orient, or Mexico. Day and night a vaulted marble lobby larger than Ctesiphon's ancient Hall, swarms with salesmen, groups of emigrants, booted cowboys, dimple-kneed schoolgirls, and invalids in wheel chairs off in quest of longer life in Tucson or Texas.

Now and then a long-haired Indian, garbed in cheap, ill-fitting clothes, may appear. But don't misjudge him; he may be an Oklahoma oil millionaire going east to buy the latest model of high-priced limousine!

Here is yet the path of empire. Millions have used it since ox-team times, and still the stream swells. An avenue it was, in early days, that tied America to Mexico, the sole means of social, business, and political contact between the two countries. History knows other great trade routes, of course—there were the famous "silk streets," or caravan trails from China to the Rhine; and from Peru down to Argentina the walking Incas carried their wares—but the Santa Fe Trail, in one short century, has become one of the most traveled routes in the world.

Southwest into Kansas the Old Trail runs; thence west along the north bank of the Arkansas River, which formed part of the boundary between the United States and Mexico until the war of 1846-48. A few miles west of where Dodge City stands the Trail originally crossed the river, at Cimarron Crossing, following the Cimarron Valley over southwest Kansas and on to Las Vegas, New Mexico. But this road crossed many miles of waterless land, and later pioneers blazed a longer but more watered path (see map, page 216). This latter branch became in time the main thoroughfare, especially for wagons. It follows the Arkansas River into Colorado, through La Junta and Trinidad; thence over Raton Pass, and to Las Vegas and Santa Fe. To-day the Santa Fe Railway and the popular Santa Fe motor highway use this same route or closely parallel it.

From Franklin, Missouri, to Santa Fe the old trail is now well marked by monuments set up by the Daughters of the American Revolution. From one marker to the next, not a stretch of this long, grave-dotted Trail but has its story of hardship, hunger, thirst, Indian attacks, stampedes, burned wagons, murdered men, and captured women. Traced through Kansas, the Trail touches towns now which did not exist when ox teams and stages used it.

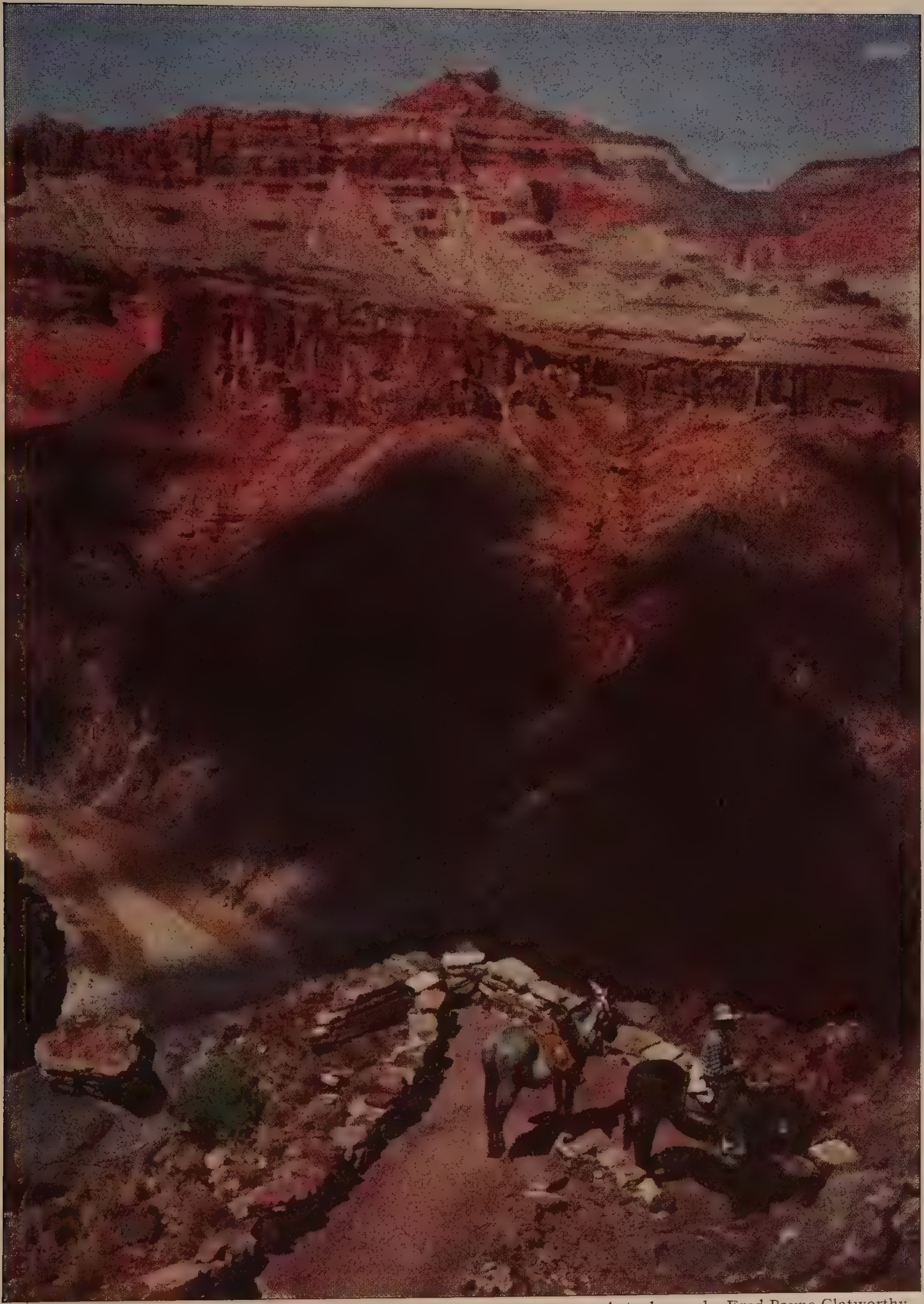
It touches other spots, too, like Black Jack, Pawnee Rock, Fort Dodge, and Cimarron Crossing, all famous in its history. It was at Black Jack that John Brown of Kansas, executed later at Charles Town, led his Free-Staters against the Missourians; and it was back from Lawrence that Quantrell and his Missouri guerrillas retreated after their historic raid on the town.

WHERE THE INDIANS CEDED TRAIL RIGHTS TO THE WHITES

At Council Grove stands a trail marker of unusual significance. Here, in 1825, agents of the American Government met the Osage chiefs and made a treaty with them. Under it the Indians gave all Americans perpetual right to use the Old Trail across their lands. For this permit the Osages got $500 cash and $300 in goods!

Motoring now through busy towns or past well-kept, prosperous farms, on smooth-paved highways, watching for speed cops instead of Indians, it is hard to realize that only a few decades ago men as wise as Washington Irving prophesied that Kansas must remain as uninhabitable as the deserts of Arabia.

"These great steppes seem only fitted for the haunts of the mustang, buffalo, antelope, and their migratory lord, the Indian; they are too isolated to become the abodes of civilized man," wrote Gregg in his "Commerce of the Prairies." Yet nearly



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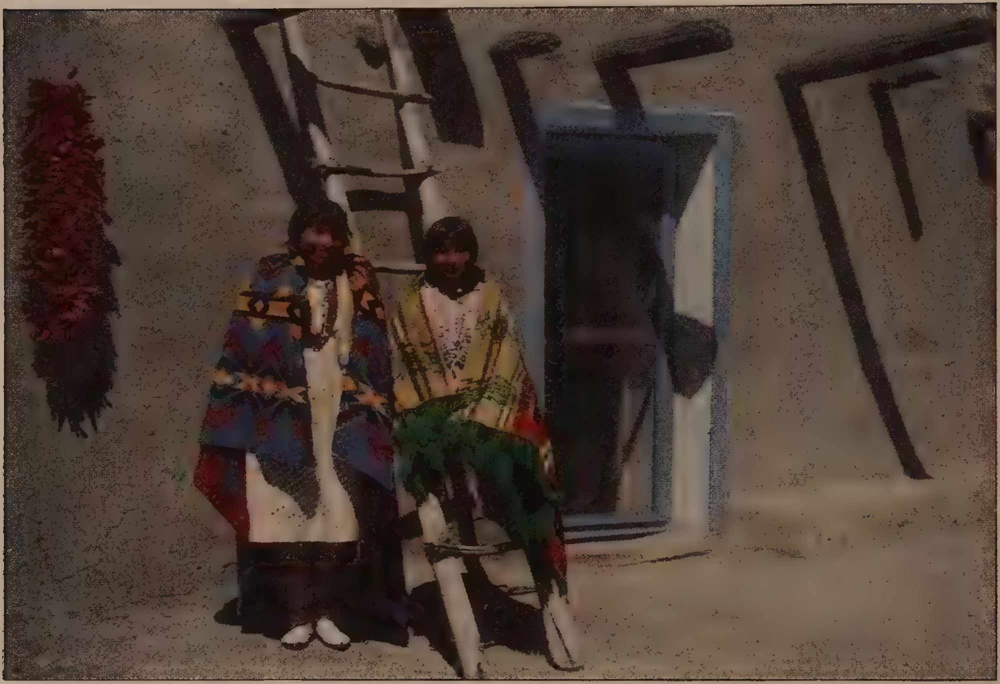
Autochrome by Fred Payne Clatworthy

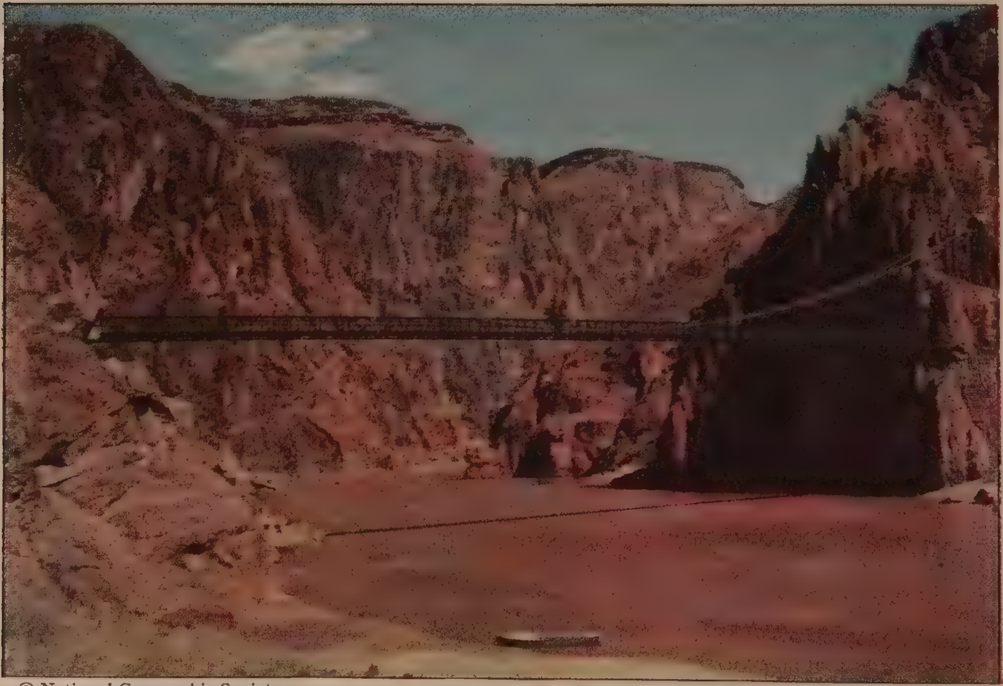
SUN GLOW AND CLOUD SHADOW SPLASH GRANITE GORGE WITH SPLENDOR

Seen from this turn of Tonto Trail, 1,200 feet above the Colorado, the master mural of the Grand Canyon changes ceaselessly, as if—now here, now there—expunged and repainted with a brush of winds by some impatient celestial artist.



BRIGHT HUES DELIGHT THE INDIAN MAIDEN'S HEART

Though these girls of Santa Clara Pueblo, New Mexico, have abandoned the beaded deerskin for colored prints, and their adobe home boasts a screen door, they still cling to the bizarre blankets and white boot-moccasins of their tribe.



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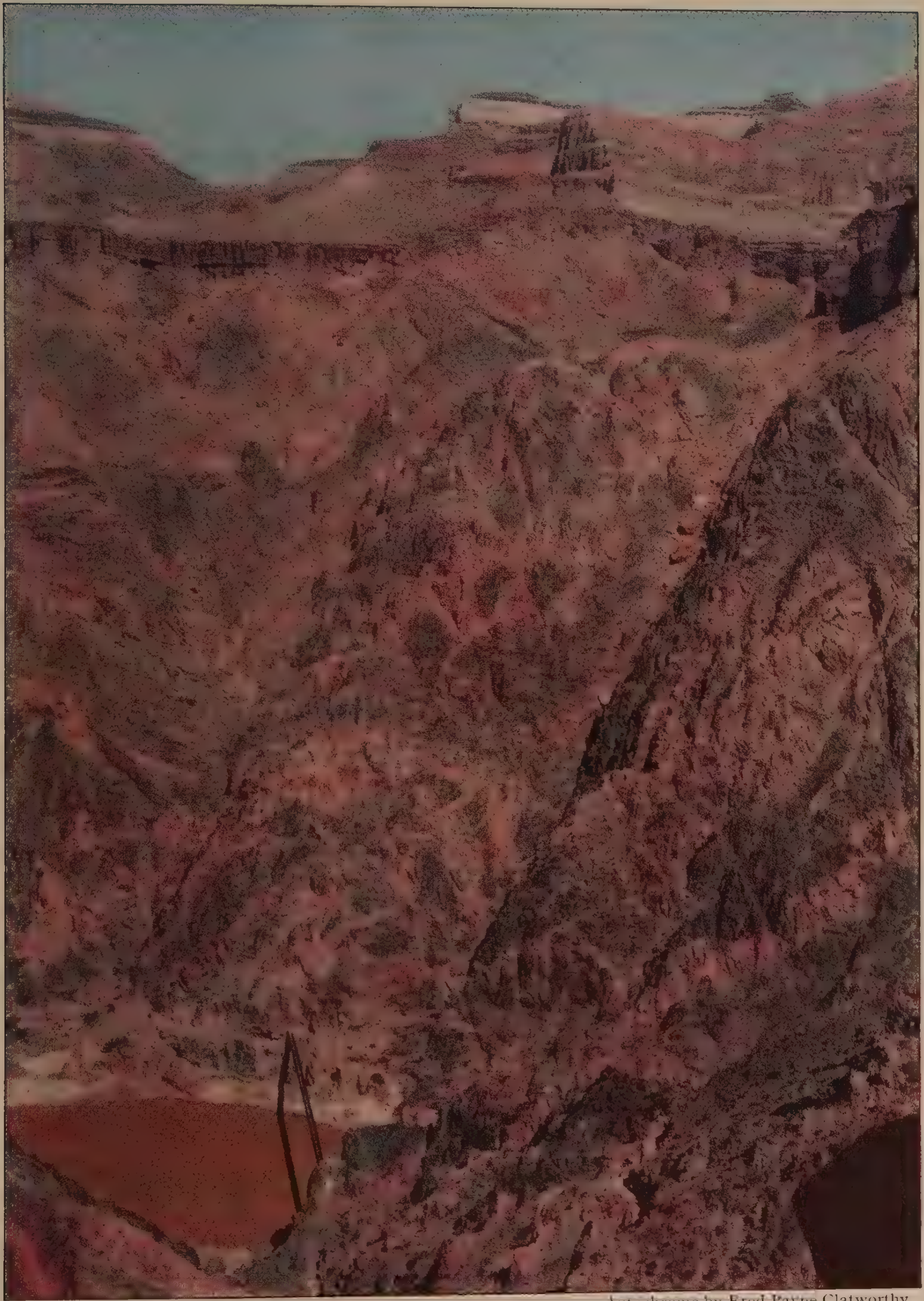
ACROSS THE CHASM CUT THROUGH COUNTLESS ÆONS MAN HAS FLUNG A PATH

The new suspension footbridge of steel at Granite Gorge is about 400 feet long and 90 feet above the ordinary level of the river. But at times of high water the mighty Colorado leaps halfway up to the span as if in angry protest against the impudence of the builders.



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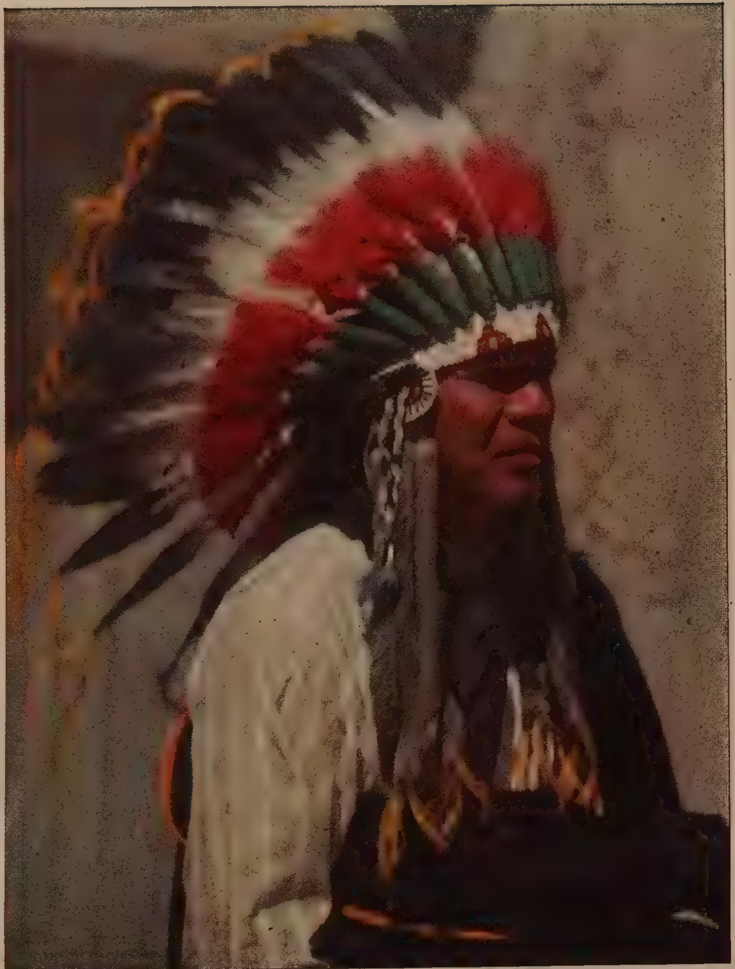
HEIGHT AND DEPTH ASTOUND THE CANYON TRAVELER

Tonto Trail winds along the wall of Granite Gorge so high that from it the suspension footbridge spanning the Colorado looks like a stick lodged crosswise in a crevice (see also Color Plate II); yet bastions of empurpled rock tower equally far above the road.



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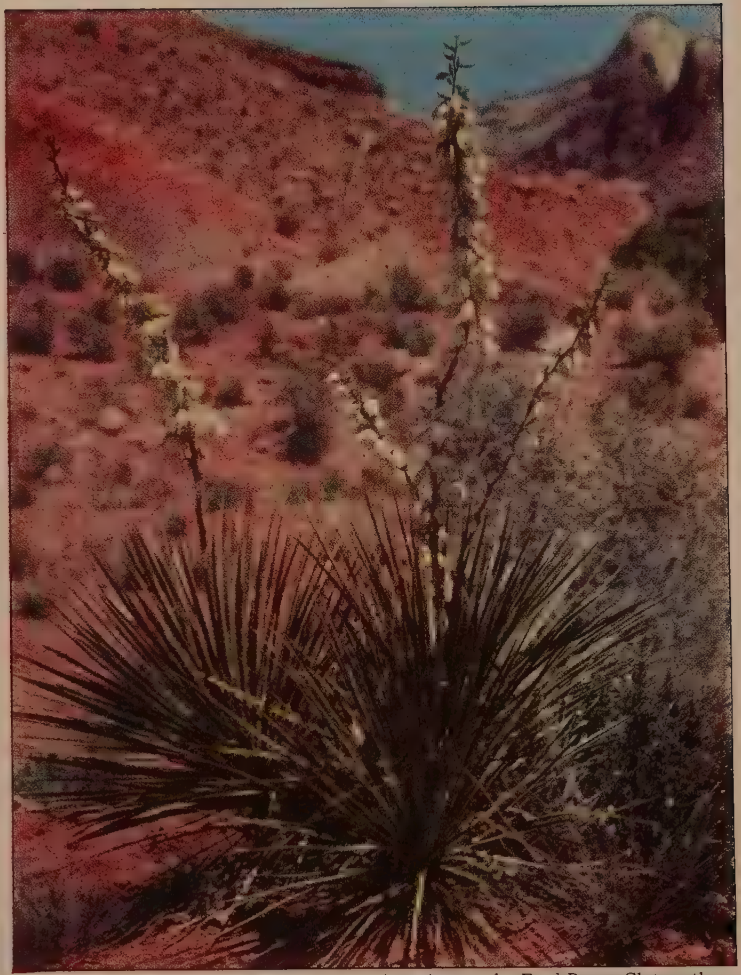
EAGLE FEATHERS ADORN THE HEADDRESS OF THE BRAVE

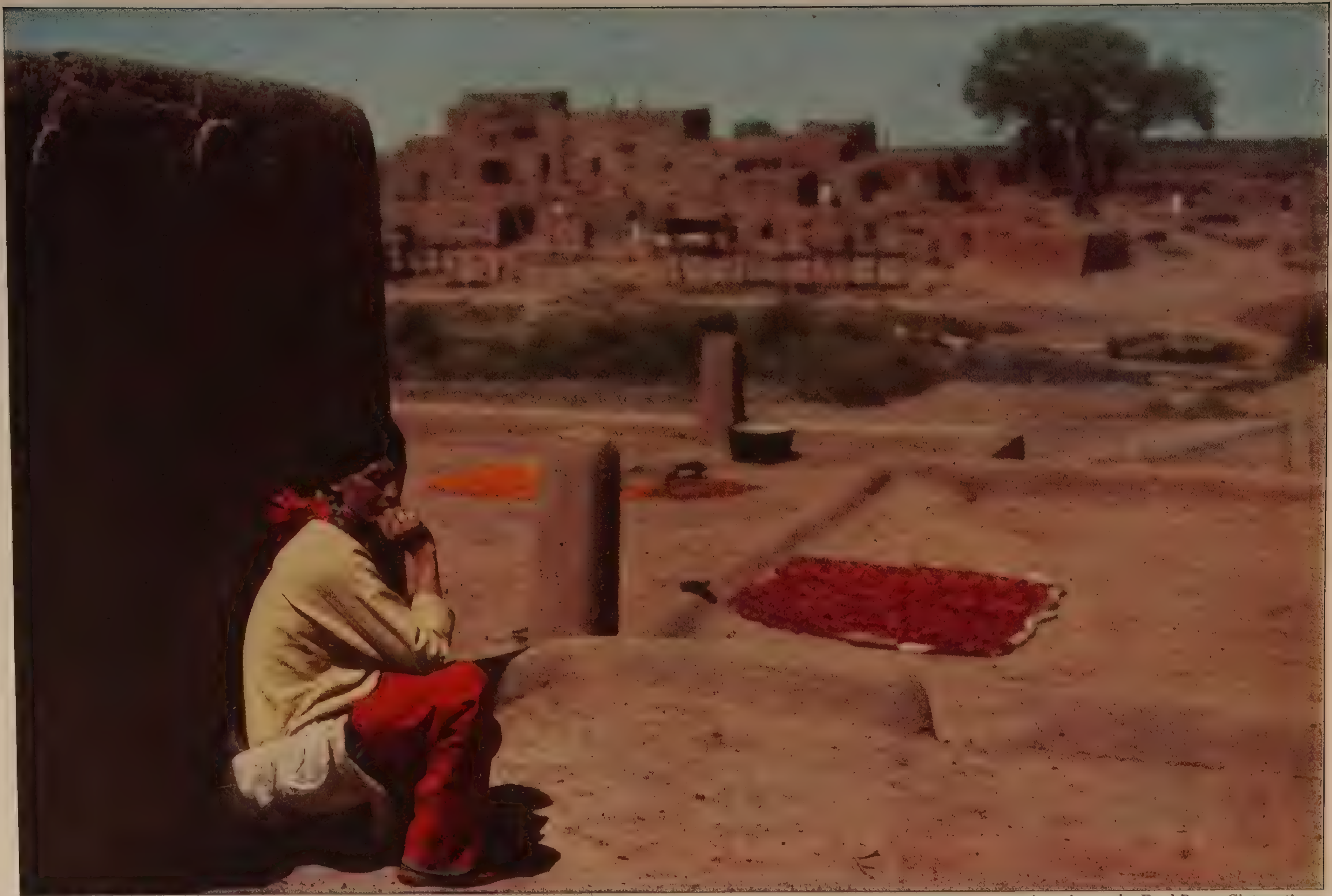
Santa Clara Indians wear striking costumes in their tribal dances. Each detail in the crown of plumes has its traditional meaning.



Autochromes by Fred Payne Clatworthy

SPANISH BAYONET IS A TRUE FLOWER OF THE DESERT

From a bristle of dagger leaves, harsh as the arid wastes that nourish it, the Yucca thrusts up tall stalks of delicate blossoms.



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IN SPARKLING SUNSHINE CHANGELESS TAOS DREAMS EVER OF YESTERYEAR

The gayly bedight Indian sits pensive, musing perhaps on the departed glory of his tribe, lords of the Southwest in Coronado's day. Near him red peppers and plums, spread out to dry, make brilliant rugs. In the distance looms the many-terraced North Building of this peculiar people.

A WHITE-BOOTED WOMAN CARRIES WATER TO TAOS

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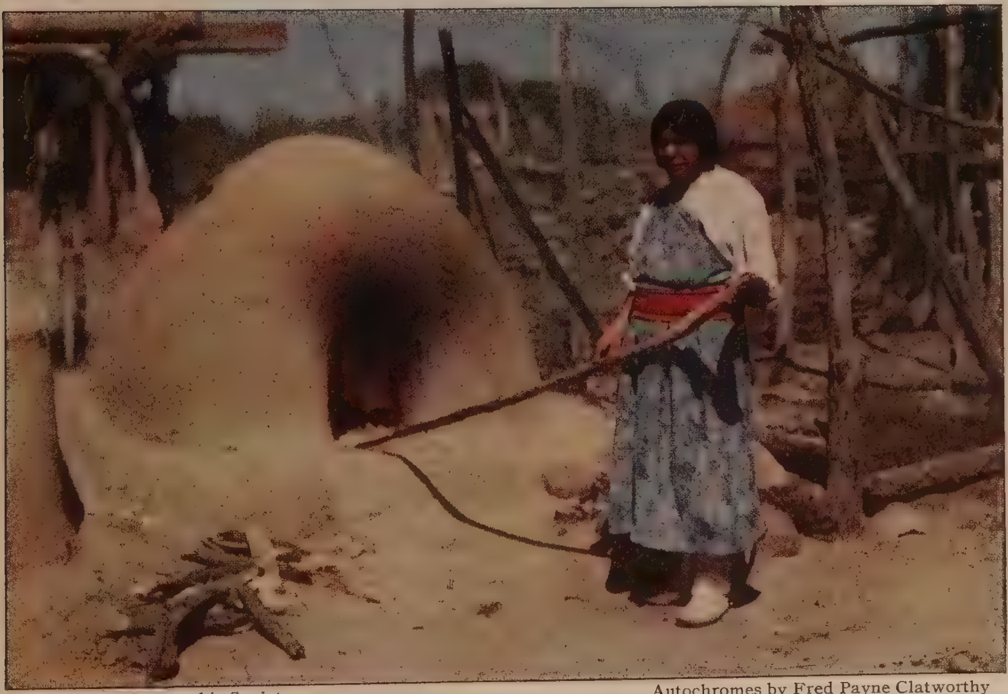
WATERLILIES FLOAT ON A MAGIC MIRROR OF UNBELIEVABLE BLUE

Glacial lakes, like strips of the summer sky, starred with flowers and holding adream in their crystal depths the images of mighty conifers, abound in Rocky Mountain National Park.

FEBRUARY IS ALMOND-BLOSSOM TIME AT BANNING, CALIFORNIA



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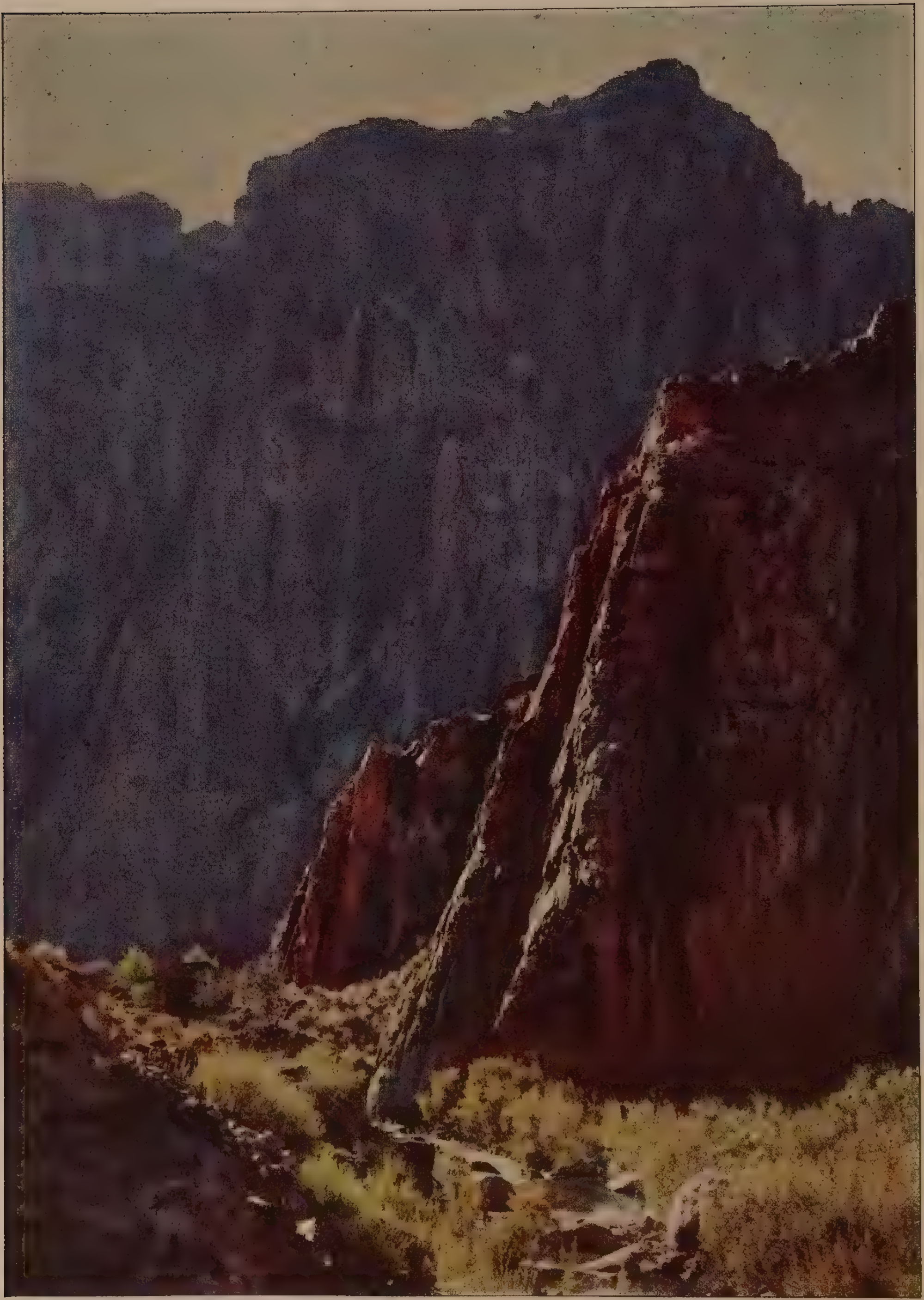
BAKING DAY IN SANTA CLARA PUEBLO

When the thick shell of the adobe oven is hot, the Indian woman will rake out the embers and set her loaves to brown in this primitive fireless cooker.



© National Geographic Society Autochrome by Fred Payne Clatworthy

PURPLE GRANDEUR LOOMS ABOVE BRIGHT ANGEL TRAIL

Where the crystal waters of this creek join the turbulent Colorado, Maj. John Wesley Powell rested on his first voyage through the Grand Canyon and, delighted with the quiet beauty of the place, gave it its poetic name.

2,000,000 people live here now, with a per capita wealth of more than $3,500.

Much of Kansas affords a rare example of man's economic conquest of a once almost worthless region. Any discussion of its early social disorders, its sanguinary political fights, its devastating drouths and grasshopper plagues, would be out of place in a story about the Santa Fe Trail. But one cannot follow this Trail across the State and talk with pioneer farmers and merchants who remember, for example, when 50,000 dissatisfied people quit Kansas in 1889 for Oklahoma, and who remember when armies of broken and bankrupt home-seekers turned sorrowfully back east, without gaining a vivid picture of the struggle Kansas made for salvation.

Science, power machines on farms, the magic of quick communications, irrigation, coöperative market methods, and blind pioneer persistence—these are factors in the rise of Kansas. Spots in its west are to-day, of course, nearly as empty as when Coronado came in 1541 and found "mighty plains and sandy heaths, smooth and wearisome, full of crook-back oxen, and a shower of hail as big as oranges, which caused many tears and vows."

But in Kansas to plant a tree is an act of grace. Since I first saw it, as a boy, the aspect of its landscape has been much changed by trees. Sunburnt boom towns now have tree-lined, shaded streets. Nor is the whole State a flat plain, as often assumed. Riding the Old Trail out the "Kaw," one sees bluffs and hills of some height. In fact, this part of Kansas, with its belted uplands and broken, dipping rocky strata, as in the Flint Hills, has often been compared to northern France. Many patches of native woods, with groups of imposing old cottonwoods, adorn this region; and, from Oklahoma, Kansas pioneers long ago brought the Osage-orange, an ornamental hedge familiar now in many parts of the Middle West.

ON HISTORIC PAWNEE ROCK PASSING PIONEERS CARVED THEIR NAMES

Pawnee Rock, famous landmark, near the present town of that name, is a cliff on the north rim of the Arkansas Valley. The Old Trail runs in its dark, bloody shadow. It was long feared as the most dangerous spot on the whole march to Santa Fe. Indians resting upon it could see for miles over the Ash, Walnut, and Arkansas valleys and make ready to ambush the coming wagon trains. It was here that young Kit Carson, standing guard at night, mistook his own mule for an Indian and shot it! On the hill's rocky face thousands of freighters, soldiers, trappers, gold-seekers, and emigrants carved their names beside the petroglyphs of savages (see illustration, page 234).

Climb upon what is left of it now, since pioneers quarried here for building stone, and you can understand why rival Indian tribes fought for it. Miles away sweeps the great bend of the Arkansas; and there lies the rich valley of the Walnut, for ages a vast, watered region of green grass, feeding ground for countless buffalo. Seeking meat, various warring Indian tribes often met here, and this region was the scene of more tribal conflicts than any other spot in America. Particularly it was the arena of death struggles between the powerful Pawnees and their hereditary enemies, the Cheyennes.

WHEN THERE WAS "NO GOD WEST OF DODGE CITY"

Fort Dodge, near Dodge City, used now as a soldiers' home, played an extraordinary rôle in the conquest of the Plains. From here, on one of his daring dashes, Custer took the field in deep snow to punish Indians. In a surprise attack he charged their camp, his mounted band playing "Garry Owen," stirring tune dear to every old trooper of the Seventh Cavalry.

"There is no God west of Dodge City." That was a saying in the turbulent days of the town's youth. Gamblers, gold-seekers, buffalo-hunters, and cowboys, bringing millions of cattle "up trail" from Texas to be loaded on the railroad's end in Kansas, frequented its dens and dance halls then.

"But all that's changed now," a citizen told me the night I arrived. "Nothing now, but just peace and plenty." But even as he spoke the sharp bang-bang of gunfire came from the alley back of the hotel. One more deputy sheriff gone—with the ghosts of Boot Hill! But this was merely inopportune—not at all usual in the Dodge City of to-day.

Dodge City now is the metropolis of southwest Kansas, an important distrib-

Photograph by Ewing Galloway

EVEN INDIANS ENJOY A GOOD STORY!

These cheerful, robust sisters are fine types of Kiowas. They were photographed while visiting the Haskell Institute, the Indian school at Lawrence, Kansas.

uting center for farm machinery and merchandise. The rail center of fourteen counties, growing about 30,000,000 bushels of wheat annually, it is also the seat of a great milling industry. Where pioneers saw only buffalo grass, Kansas now grows corn, wheat, oats, barley, milo maize, alfalfa, and other crops. Through its north-central counties flows the Arkansas River, in whose rich valley sugar beets and other irrigated crops are grown. In this region the yearly crops are estimated to be worth $75,000,000.

RUSSIAN MENNONITES BROUGHT WHEAT SEED TO KANSAS

From a few bushels of "Turkey" seed wheat, brought here years ago by Russian Mennonite settlers, Kansas developed a prodigious industry. Wheat production has grown by more than 200 per cent in less than ten years. Often a single farmer cultivates as much as 1,000 acres. More than 5,000 "combined" harvesting machines are used in this district. The great factor in this growth of farm life has been the power machine, the truck, tractor, combine, and other implements which cut labor costs and make large-scale farming easy.

One sod shanty formed all of Dodge City only 60 years ago. Millions of buffalo roamed these plains then, with deer, antelope, and other game. But when the railroad came, in the early 1870's, a rousing, colorful frontier town soon grew up, furnishing supplies for hunters, ranchers, military posts, and Indian agents. It was then, with Texas cattle arriving in endless herds, that Dodge City became and remained for years the greatest shipping point for range cattle in America.

So many buffalo roamed the Plains then that at times railway trains would have to stop and wait for vast herds to cross the track. Passengers, firing from the train, wantonly killed them for the mere excitement of it. Market hunters, too, slew these animals by the countless thousands merely for their robes. Old photographs show great stacks of buffalo hides piled at the track awaiting shipment (see illustration, page 235).

Photograph by Ewing Galloway

THE INDIAN SCOUT, AS DEPICTED BY CYRUS DALLIN

This impressive figure stands in Penn Valley Park, Kansas City, Missouri.

There is a popular yarn to the effect that in the early days of Fort Riley the commanding officer issued an order reading:

> "1. Members of this command will, when shooting at buffalo on the parade ground, be careful not to fire in the direction of the C. O.'s quarters.
>
> . . . .
>
> "3. Officers will discontinue the practice of roping and riding buffalo."

In the hard, lean years that came when the buffalo was practically exterminated and before local farming succeeded, many a western Kansas community existed by gathering up buffalo bones. Trainloads of them were shipped east to make fertilizer and buttons.

THE LAST OF THE COUNTY-SEAT WARS

Shady, peaceful Cimarron, with its neat homes and happy, frolicking children, suggests naught of those exciting years when blaspheming bullwhackers drove their creaking wagons through its streets or forded the river here for the shorter southern path to Santa Fe. But its older residents well remember that noisy day in 1889 when armed men from near-by Ingalls raided it, "shot it out" with Cimarron citizens, and seized and carried away the county-seat archives. It took the State militia to restore order after this last of the really bloody county-seat wars of western Kansas. At the time the *New York Tribune* said:

> "The news that another county-seat war has broken out in Kansas has found its way to New York by telegraph. Once more a four-mule team is attached to one of the courthouses and it is going across the prairie on a fast trot.
>
> "The existence of the western Kansas courthouse is at best transitory and uncertain. . . . One day the stray swine of Occidental City seek its hospitable shade, the next some predatory calf in Big Stranger bunts open the back door and eats a deed and two mortgages while the registrar is taking a nap. To-day we mark it in Grand Junction with a new front door

Photograph by L. Palenske

DEATH LURKED IN THE DARK SHADOWS OF PAWNEE ROCK

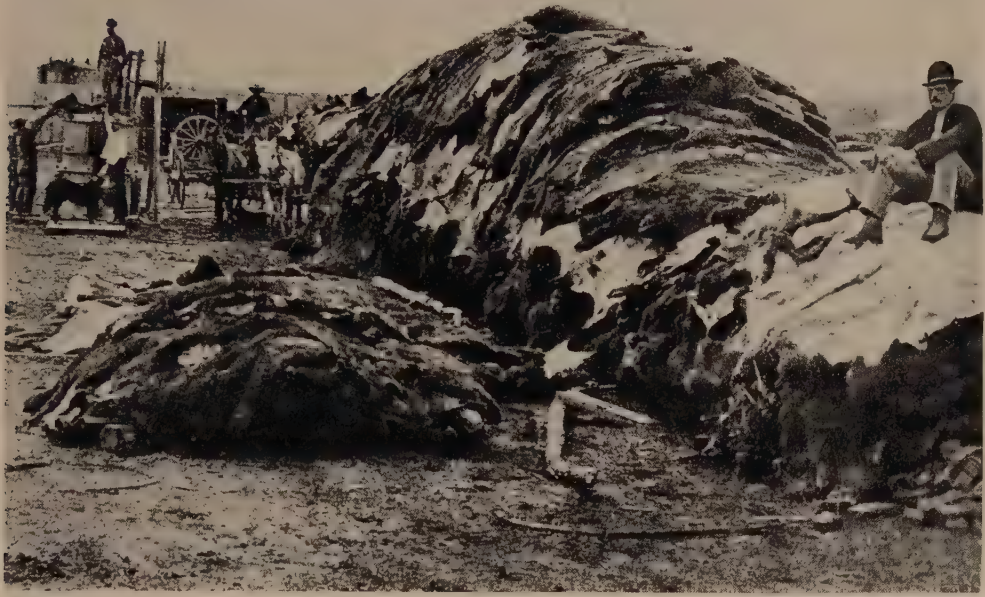
In this vicinity Indians time and again attacked wagon trains traversing the Arkansas River Valley. On the face of the frowning rock thousands of emigrants, freighters, trappers, and soldiers carved their names, some of which are still legible (see text, page 231).

GOEST I WILL GO WHERE THOU LODGEST I WILL

Photograph from Roy Godsey

THE PIONEER MOTHER

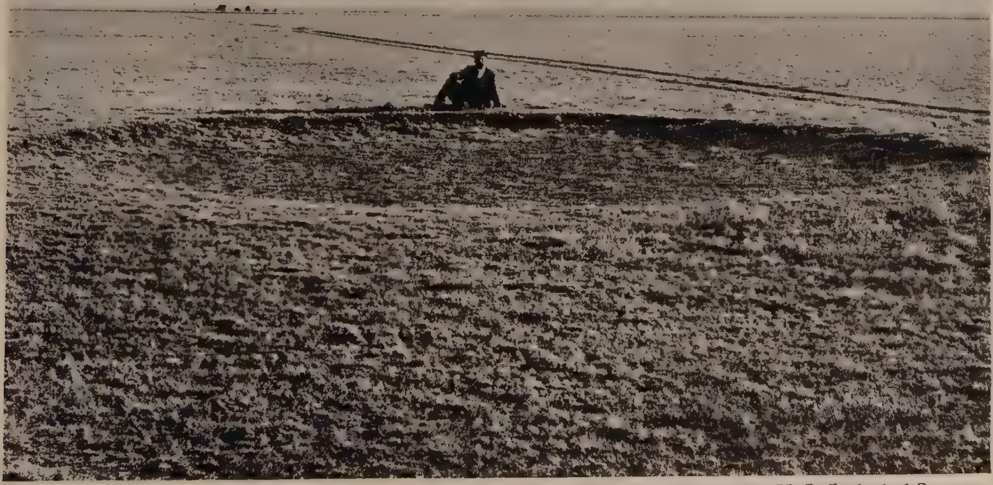
Stout of heart, thrifty, emigrant women braved the perils of the West to help make America. In Penn Valley Park, at Kansas City, this monument to them overlooks the Santa Fe Trail.



Photograph by H. F. Schmidt

A PILE OF 40,000 BUFFALO HIDES IN EARLY DAYS AT DODGE CITY

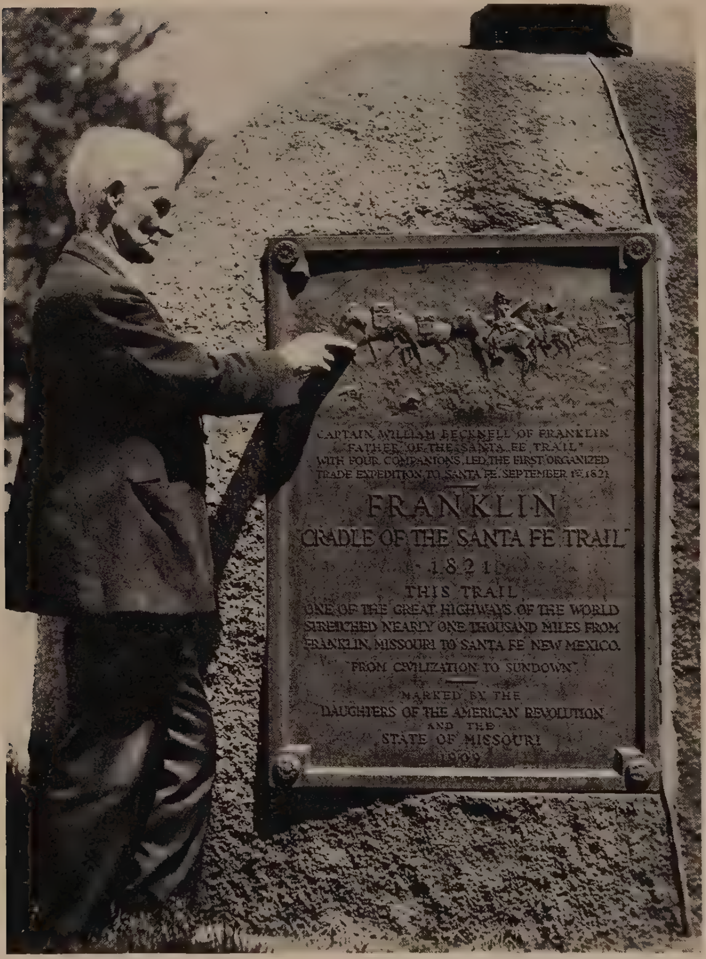
"Buffalo City" this town was first called because it was the center of that grim business of shooting and skinning buffalo. Later, in lean years, buffalo bones became a medium of exchange (see, also, text, pages 232-233).



Photograph courtesy U. S. Geological Survey

A BUFFALO WALLOW IN KANSAS, PHOTOGRAPHED SOME YEARS AGO

Before farms spread over the grass country these depressions, wherein buffalo wallowed to scratch or free themselves of flies, were common on the western Plains.


CAPTAIN WILLIAM BECKNELL OF FRANKLIN
"FATHER OF THE SANTA FE TRAIL"
WITH FOUR COMPANIONS LED THE FIRST ORGANIZED
TRADE EXPEDITION TO SANTA FE, SEPTEMBER 1st 1821
FRANKLIN
"CRADLE OF THE SANTA FE TRAIL"
1821
THIS TRAIL
ONE OF THE GREAT HIGHWAYS OF THE WORLD
STRETCHED NEARLY ONE THOUSAND MILES FROM
FRANKLIN, MISSOURI TO SANTA FE NEW MEXICO.
"FROM CIVILIZATION TO SUNDOWN"
MARKED BY THE
DAUGHTERS OF THE AMERICAN REVOLUTION
AND THE
STATE OF MISSOURI
1909

Photograph from Rehmeier Studio

THE FIRST MARKER ON THE SANTA FE TRAIL

Monuments erected by the Daughters of the American Revolution and the States now identify the course of the Trail for the traveler (see, also, page 212). This first marker stands at New Franklin, Missouri, built on the hills just north of the original Franklin.

painted yellow, and the gable end blown off by the last tornado, but to-night a band of determined men will come from Rattle Snake Crossing and haul it away with a yoke of oxen, with the mayor and city council of Rattle Snake pushing on the end of the courthouse."

BUSSES NOW FLASH BY AT 50 MILES AN HOUR

In startling reminder of the sweep of progress, I sat in the shade of trees at Cimarron Crossing and watched big busses whizzing by. Sprawled in cushioned seats, amid comforts undreamed of in ox-team days, dozing passengers went whirling by at 50 miles an hour. From New York to California many such big 120-horsepower busses now run. To-day bus lines connect all the cities of the West, some of them with berths like those on trains, with running water, smoking compartments, and even the friendly radio to cheer travelers over the main streets of America. One after another I watched them whiz along where the bullwhackers used to plod.

"When we crossed the river here," said one man who still remembers, "there was a spot so deep that the usual string of oxen couldn't get a foothold; so we hitched 32 yoke of cattle to each wagon. We got the train across, but it took all day." Now, in one day, a modern bus runs half the length of the whole Old Trail—the trail it took ox teams weeks to negotiate!

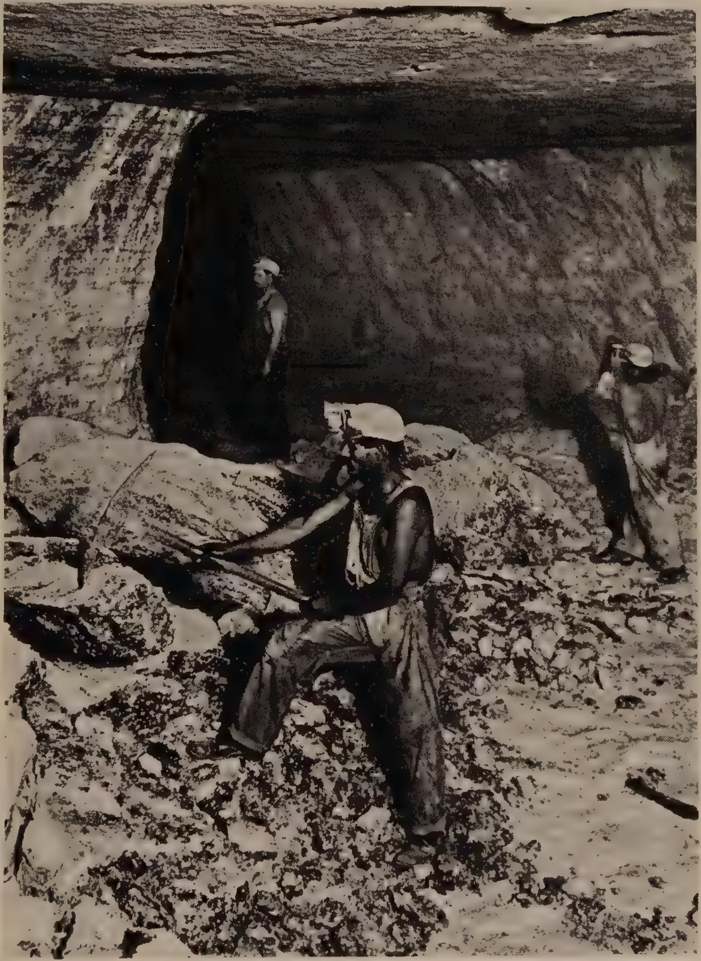
To-day, on the new Old Trail, fuel, at gas stations, is everywhere, at convenient intervals. But one pioneer writes: "At Ash Creek, west of Pawnee Rock, was the last place to get wood before New Mexico. Often we hung logs under the wagons, and always we had a bag hung on the side of the wagon box, into which everybody tossed chips or stray bits of wood for starting cook fires."

THROUGH THE "VALLEY OF CONTENT"

From Cimarron west the Old Trail parallels the north bank of the Arkansas, through "The Valley of Content," as local inhabitants style this amazingly productive region. Garden City, famous for its sugar-beet industry, and the town of Coolidge, near the Colorado line, were undreamed of in ox-team times. Here much of the Old Trail has been plowed up.

Hereabout also, beyond the irrigated areas, one sees stretching away to head-quivering horizons the treeless landscape of the short-grass country. It is a land, in dry years, of gaunt cattle and the loco weed. Cattle, sheep, and horses learn to like this powerful herb. Once addicted to loco weed, a cow is like a man given to drugs—the animal seems to go crazy. It loses its sense of proportion; it will imagine that a small stick in its path is a big log, and will rear up to jump over it.

"I knew a cowboy once who chewed some," a practical joker told me, "and it made a $2 bill look to him like a $20."



© Ewing Galloway

A HUTCHINSON, KANSAS, SALT MINE

Pioneers crossing Kansas often got salt by evaporating water at salt springs.

Beyond the Colorado line, past the ruins of Bent's famous old fort, the monotony of the Plains begins to yield. Far down on the southern horizon outposts of the Rocky Mountains lift their heads.

WHERE PIKE FIRST SAW HIS PEAK

By infallible signs, now you know the ancient Spanish land is not far away. At wayside stations you catch a whiff of corn-husk *cigarrillo;* a burro sleeps near by. Men carry water in sacks, square canvas bags with a cork in one corner, to tie on motor cars in crossing dry country. Strings of red peppers begin to appear at tank towns where Mexicans work on track repairs, and at dusk you hear tinkling guitars and swarthy singers humming "La Paloma."

And here is Las Animas, first important town on the Trail with a Spanish name. Near here Pike first saw the big mountains, and the peak that bears his name. On November 23, 1806, he wrote: "About 2 o'clock in the afternoon I thought I could distinguish a mountain, which appeared like a small blue cloud. Half an hour later it rose in full view before us."

Look to the northwest now and you, too, may see the stupendous mountain mass. About it, every afternoon in summer,

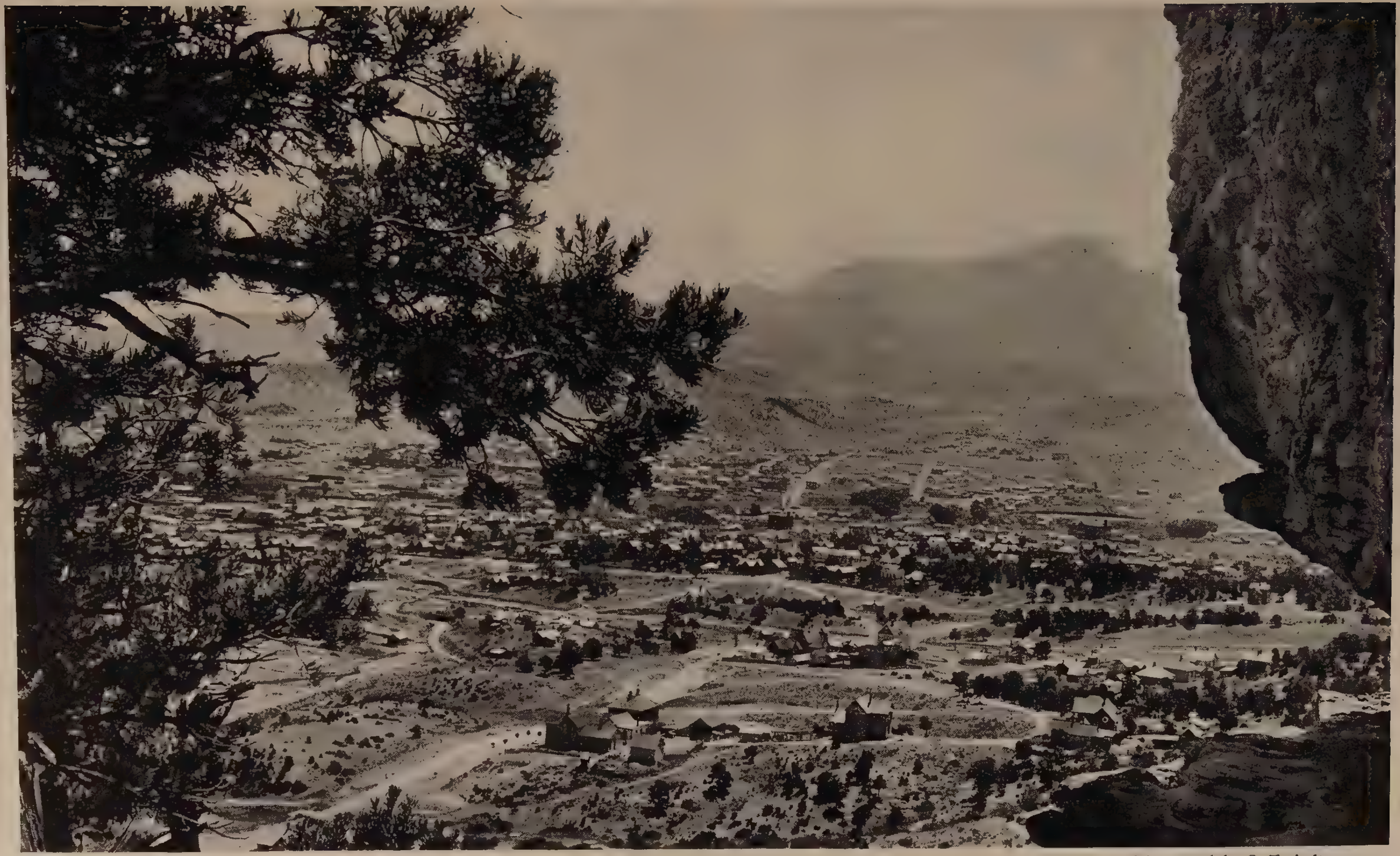
Photograph by George L. Beam

THE MAJESTIC SANGRE DE CRISTO MOUNTAINS REFLECTED IN DE WEESE RESERVOIR NEAR WESTCLIFFE, COLORADO

These giant, snow-capped mountains, only a section of which is shown here, run through the San Isabel National Forest near the Santa Fe trail.

© T. Harmon Parkhurst

DIM TIRE RUTS, HALF HIDDEN IN GRASS, MARK THIS ROMANTIC PATH TO EMPIRE



Photograph by O. E. Aultman

TRINIDAD, COLORADO, GREW FROM INNS, BLACKSMITH SHOPS, AND STABLES BUILT BESIDE THE SANTA FE TRAIL

Framed by peaks, watered by the tumbling Purgatoire, and bathed in the bright top light of Rocky Mountain sunshine, few cities anywhere enjoy so extraordinary a setting. An early view of Trinidad from Simpsons Rest, with Fishers Peak in the background.

Photograph by O. E. Aultman

A SANTA FE TRAIN PLOWS THROUGH SNOWDRIFTS ALONG A HIGH STRETCH OF THE OLD TRAIL IN COLORADO

To avoid snow and insure grass for animals, emigrants crossed the Plains in warm weather.

thunderclouds form and showers fall on Colorado Springs, at its base.

HISTORY ENVELOPS LAS ANIMAS

Las Animas bristles with history. It makes much of its place on the Old Trail. At Old Trail fiestas it has exhibited in parade the same old stagecoach that Horace Greeley rode in when he came west, and it hooks up yokes of oxen to show its children how their forbears traveled west. It points out proudly the path trod by Doniphan and his Missouri legion, when they marched this Trail and down the valley of the Rio Grande to help Scott win the Mexican War. A tragic but wonderful achievement that, compared by William Cullen Bryant to Xenophon's Expedition, embalmed for all time in classic Greek.

Veering southwest now, through the modern railway junction town of La Junta, the Trail bears down to Trinidad, through grain and sugar beets. Heroic, indeed, is the landscape here. Small wonder the beaver trappers, the traders, and gold hunters of the Middle West seldom returned to the monotony of level lands when they had known these mountains. Pikes Peak still in sight, though more than 100 miles away, and always, like giant sentinels, through the centuries, the two towering Spanish Peaks; and then, far ahead, the mighty Raton Range, at whose feet lies the city of Trinidad, not named by pious pioneers for the Trinity, but for a Mexican girl!

Mountains keep watch over Trinidad, city of miners, movies, memories, and beans; for here is one of the largest pinto

Photograph by O. E. Aultman

THE MIDDLE FORK OF PURGATOIRE RIVER AT STONEWALL GAP, COLORADO

In memory of certain comrades who perished on this river without benefit of clergy, early Spaniards named it "El Río de las Ánimas Perdidas en Purgatorio." French-Canadian trappers shortened this to "Purgatoire." But Yankee pioneers either couldn't pronounce Purgatoire or mistook its meaning and called it "Picketwire River," which is its local name to-day.

bean centers in North America. But coal is king. They mine it by the trainload.

Here Kit Carson's memory is green. In the center of the city a monument is erected to him (see page 215), in the shadow of Fishers Peak, high point in the Raton Range, named for one of Kearny's officers who climbed it when his army camped here on the Purgatoire.

WOOTTON COLLECTED HIS TOLLS WITH A GUN

South of Trinidad the modern motor highway passes the historic Wootton Tollhouse, built long ago beside the Old Trail. Richen Lacy Wootton, a Virginian, gained fame here as a trapper, Indian fighter, and trader. A friend of Kit Carson, old Bill Williams, St. Vrain, and other noted frontiersmen of that time, he finally settled at the north end of Raton Pass. Improving the then rough trail, he put up a tollgate and collected—often with a gun—from those who used the road. The story of his life, a book long out of print, is one of the most fascinating of all frontier biographies.

Going up Raton Pass, the railway runs now right where the ox wagons left their tracks, only to disappear into a yawning tunnel, emerging on the other side of the range, in New Mexico. To-day's motor highway, a scenic boulevard winding through rocks and mountains, is an engineering wonder. Climbing it now, you pass the north border of the historic Max-

Photograph by Photo Craft Shop

ZEBULON M. PIKE, SO FAR AS IS KNOWN, WAS THE FIRST WHITE AMERICAN TO SEE THIS PEAK WHICH BEARS HIS NAME

Pikes Peak is America's best-known mountain. For decades it was a landmark for trappers, emigrants, traders, and Indian fighters, and each season tourists swarm up to its apex, 14,110 feet above the sea, by cog-tram, trail, and automobile (see, also, text, page 237).

well Land Grant. This grant was one of many made by the Spanish Government, in what is now Colorado and New Mexico, to early settlers.

By treaty between the United States and Mexico these grants were recognized. This one covered 1,750,000 acres and ran for 50 miles along the Old Trail. Maxwell, conspicuous in the annals of the Southwest, lived in baronial elegance and was known for the luxury of his lavish entertainments. I saw the ruins of his old home where, pioneers say, he kept as much as $40,000 in gold merely to meet his current expenses.

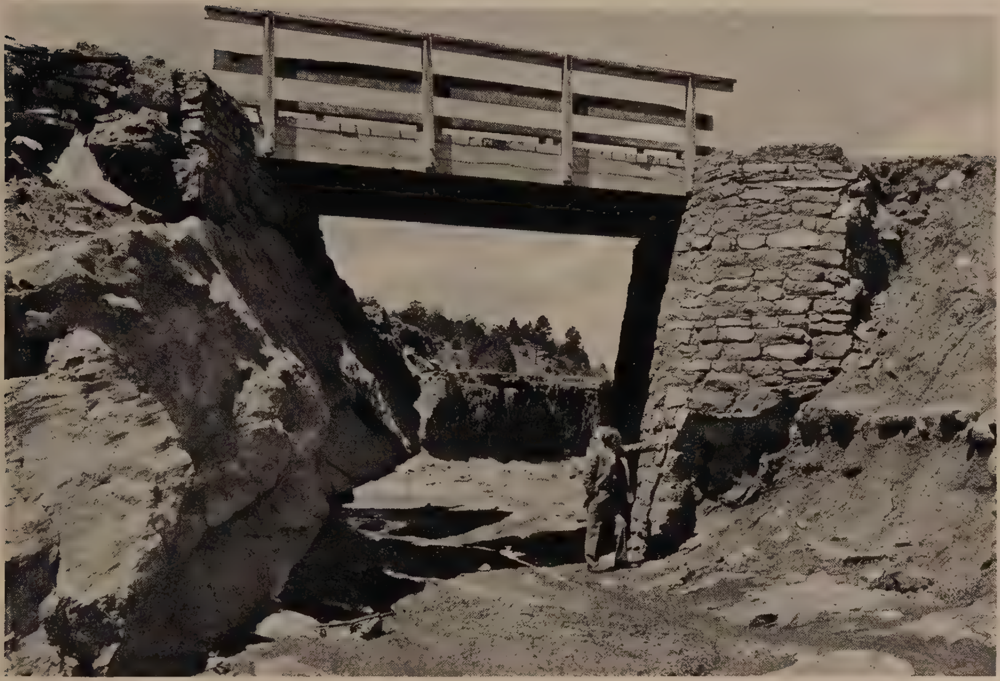
From the summit of the pass and Raton Mesa one looks down into the valley of the Canadian River; and down the well-built, winding road you enter the clean, friendly town of Raton, New Mexico. In Old Trail days it was called Willow Springs. When Kearny's army passed this way, in 1846, before Wootton's road was made, it had to draw its cannon and wagons up the steeper slopes with ropes. Raton digs coal and deals in cattle and sheep.

INDIANS LIVE ON FLAT MOUNTAIN TOPS

Hereabout you begin to see those odd-looking flat-topped mountains, or mesas, peculiar to this part of America. Erosion, through ages, has carved them out in bold, sharp forms. Rising now hundreds of feet above the Plains, they are visible as landmarks at great distances. In places, as at Acoma, Pueblo Indians have built their homes on these high, almost inaccessible, natural platforms for easy defense against such enemies as the Apaches. I asked Indians at Acoma why they stuck to their dry, dreary, windswept rock, with an easier life in the green valleys in sight below them. "Because we want to," they said.

In this dry, clear air you can see very far. At night more bright stars appear than ever eastern dwellers dream of.

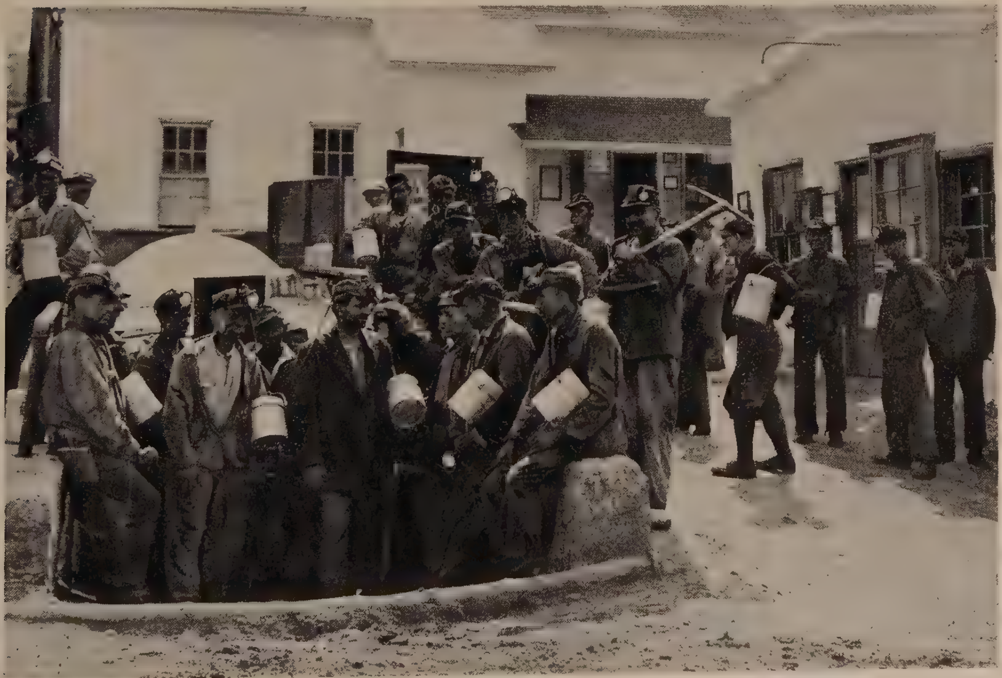
That across the deserts "you can see farther and see less" than anywhere else,



Photograph by T. Harmon Parkhurst

PLUCKY PIONEERS HAD TO BRIDGE THIS ROCKY CUT

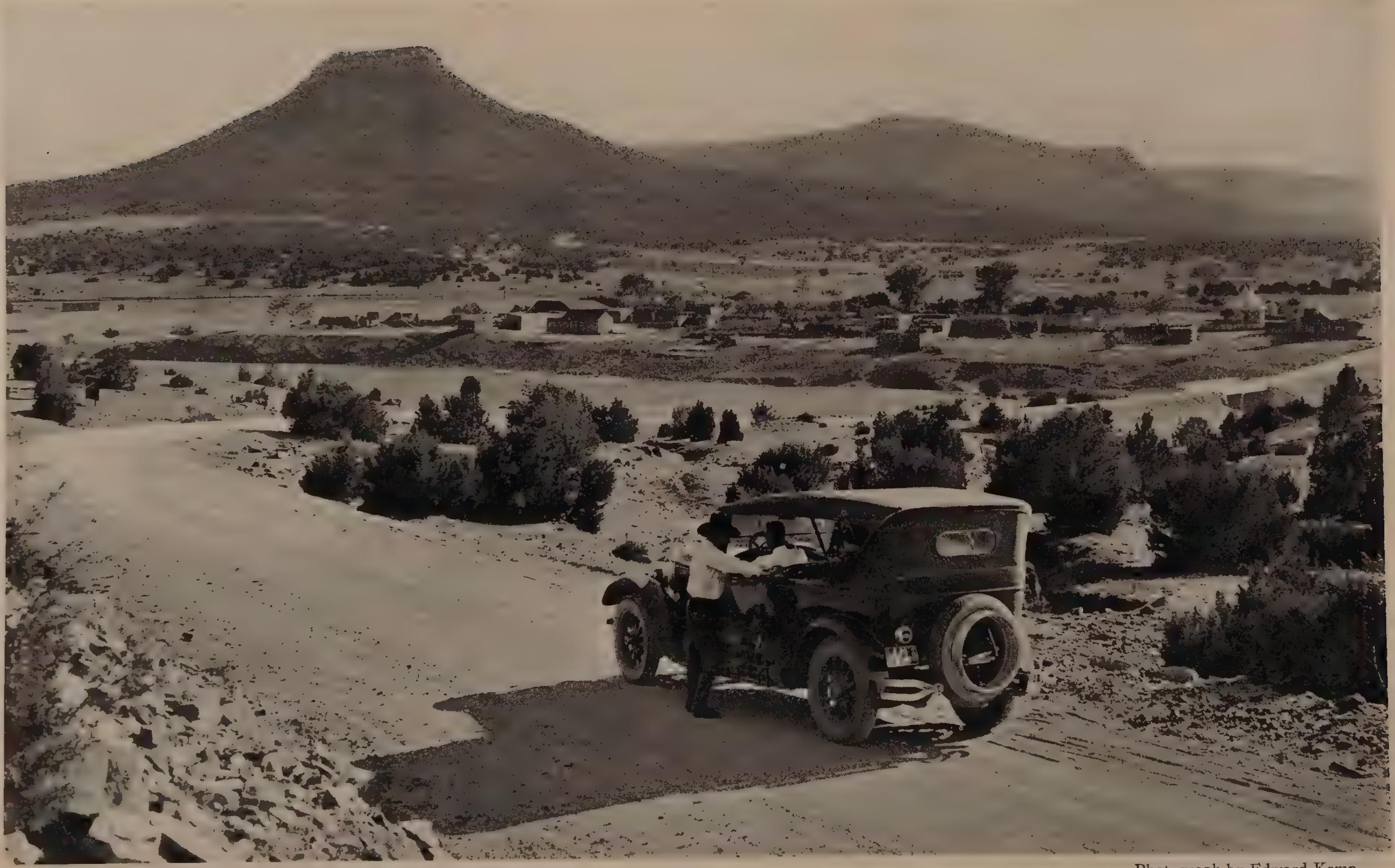
In Glorieta Pass, New Mexico, just west of the summit, the early emigrants built these abutments of stone and mortar—the last remaining bit of masonry anywhere on the Old Trail.



Photograph by O. E. Aultman

COLORADO COAL MINERS ENTERING A MANWAY NEAR TRINIDAD

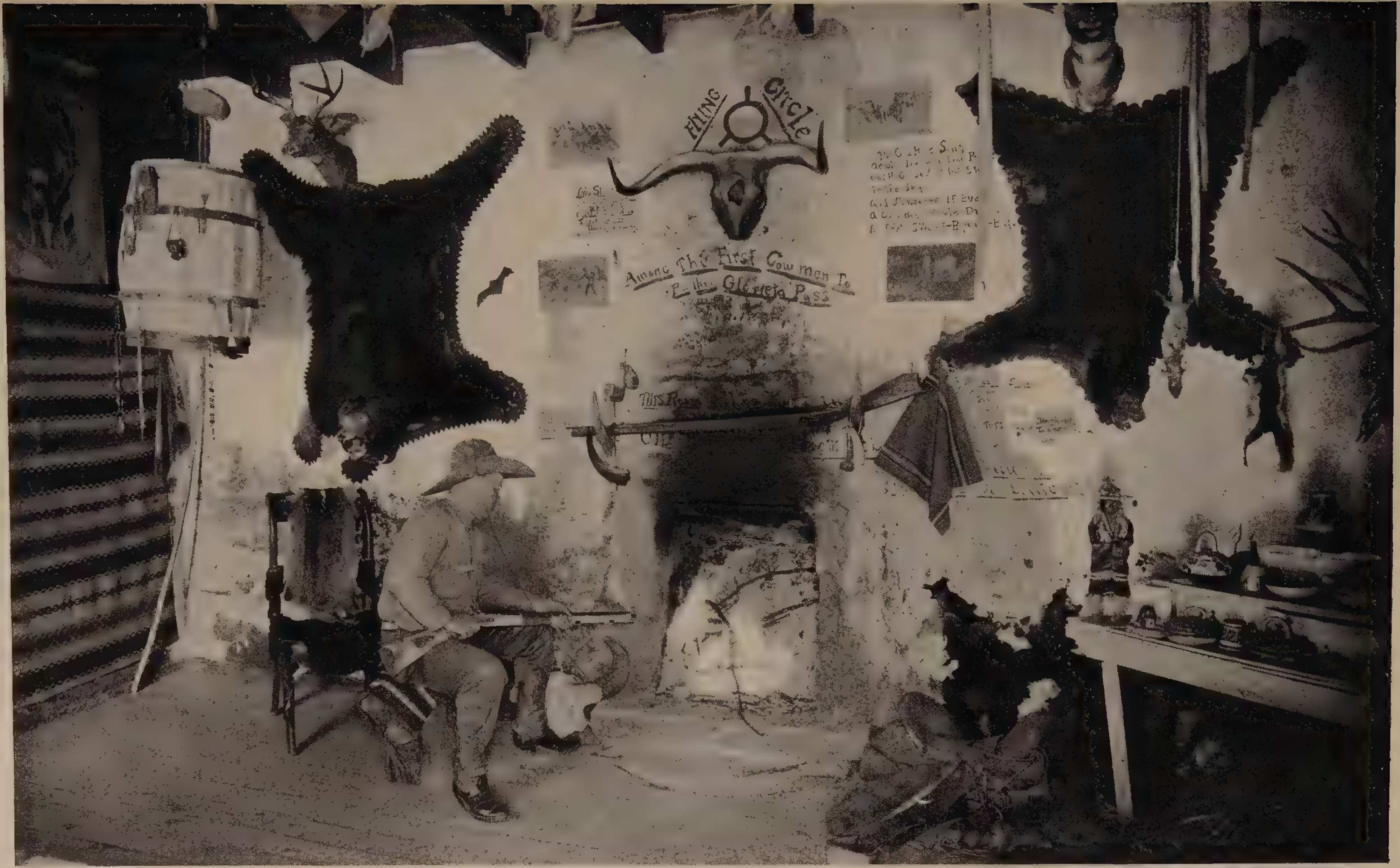
Las Animas County, of which Trinidad is the county seat (see, also, page 239), is the most important coal-producing area west of the Mississippi.



Photograph by Edward Kemp

STARVATION PEAK, A FAMILIAR OLD TRAIL LANDMARK IN NORTHERN NEW MEXICO NEAR LAS VEGAS

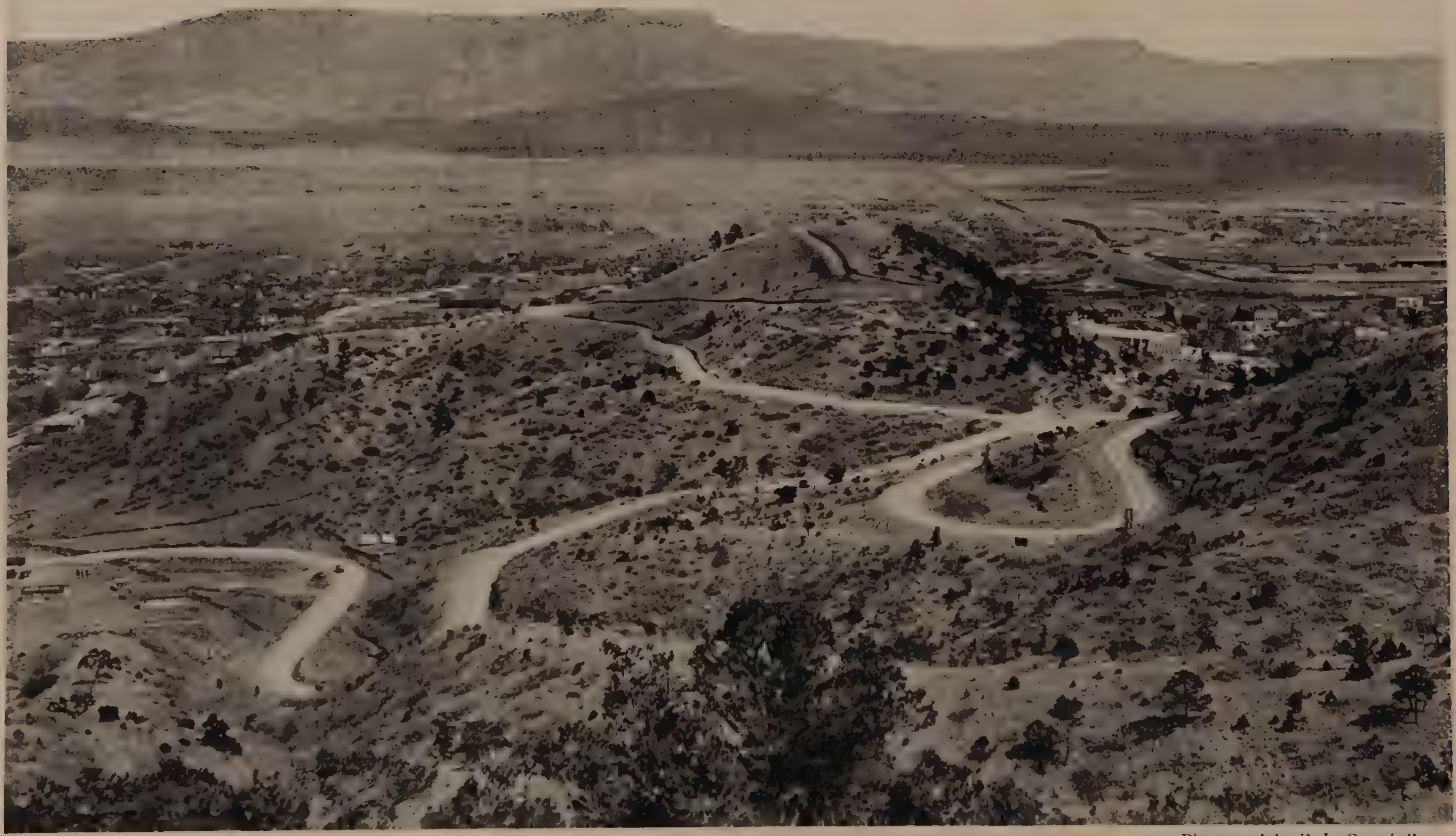
Explorers, trappers, Indian fighters, outlaws—all have used this great natural guidepost. For decades a cross has stood on its summit, in memory of emigrants who climbed up there to escape hostile Indians and starved to death.


FLYING
Circle
Among The First Cowmen To
Glorieta Pass

Photograph by T. Harmon Parkhurst

INTERIOR DECORATORS MAY SHUDDER, BUT, AS THE COWBOY SAID, "I JUST FIXED UP THIS ROOM TO SUIT MYSELF"

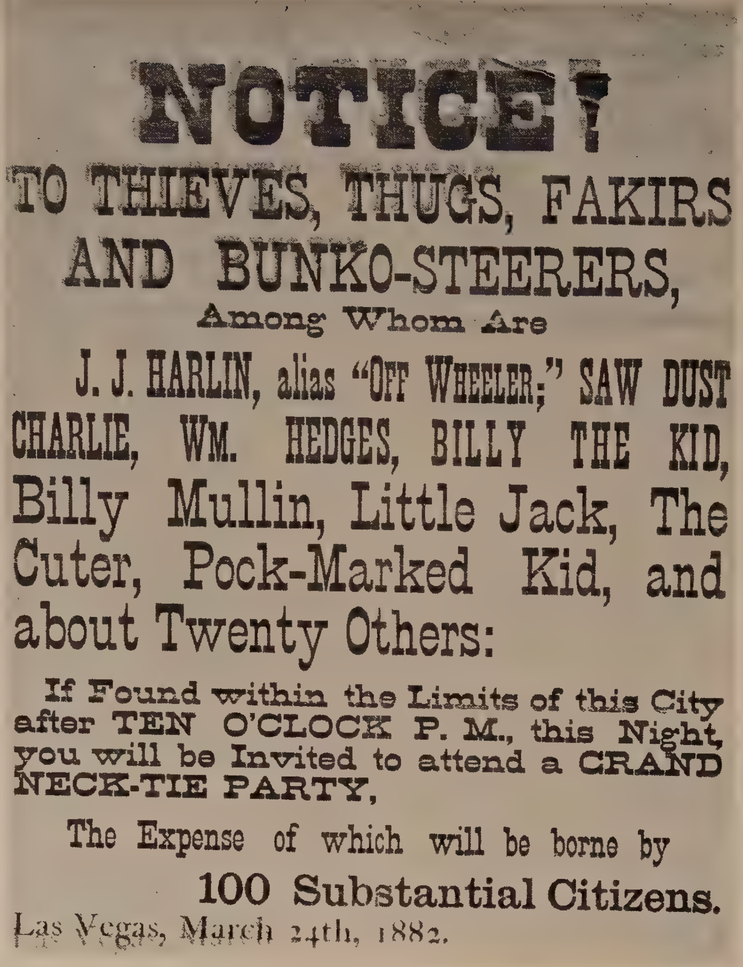
Beside the Old Trail, where it runs through Glorieta Pass, in northern New Mexico, lies the old Pigeon Ranch. For decades it was a resthouse for freighters, trappers, and emigrants bound for Santa Fe, about 20 miles distant. In this room Kit Carson and General Kearny boiled coffee and warmed their feet.



Photograph by R. L. Campbell

LIKE THE TRACK OF A GIANT SNAKE, THE OLD TRAIL TURNS AND TWISTS OVER RATON PASS

From a high point on this mesa, one with good eyesight may see into five different States: Colorado, New Mexico, Kansas, Oklahoma, and Texas. At the foot of the hill, in New Mexico, lies the clean, friendly town of Raton (see, also, text, page 242).



NOTICE!

TO THIEVES, THUGS, FAKIRS AND BUNKO-STEERERS,

Among Whom Are

J. J. HARLIN, alias "OFF WHEELER;" SAW DUST CHARLIE, WM. HEDGES, BILLY THE KID, Billy Mullin, Little Jack, The Cuter, Pock-Marked Kid, and about Twenty Others:

If Found within the Limits of this City after TEN O'CLOCK P. M., this Night, you will be Invited to attend a CRAND NECK-TIE PARTY,

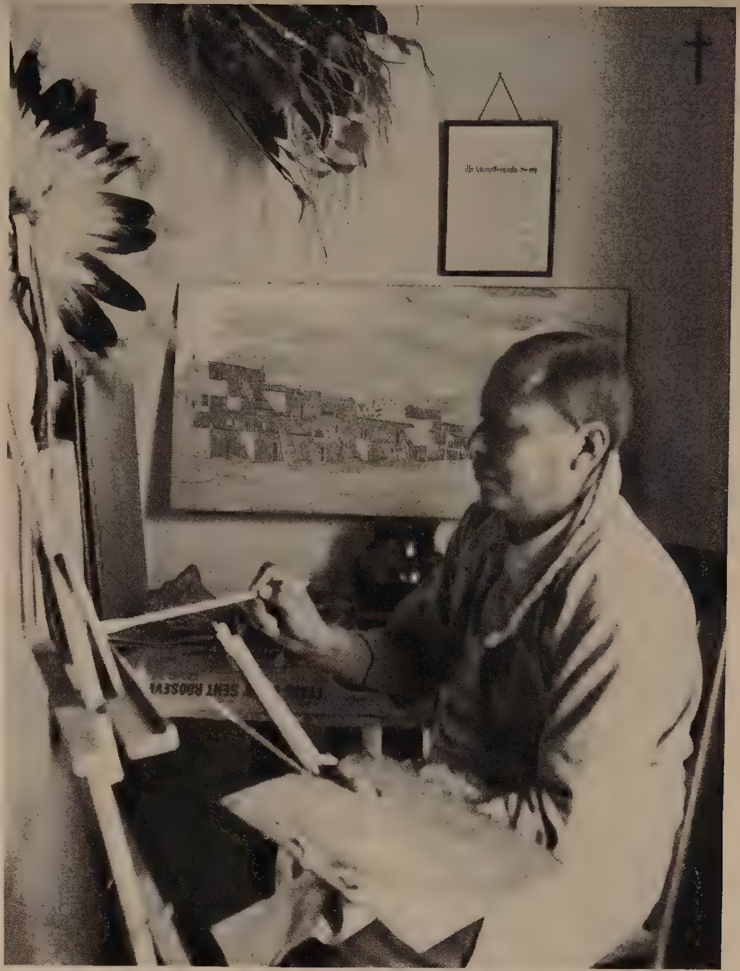
The Expense of which will be borne by

100 Substantial Citizens.

Las Vegas, March 24th, 1882.

WHEN THE ROPE WAS LAW

Judges, lawyers, policemen, handcuffs, and jails—the machines of justice—lagged behind as civilization followed the sundown; so honest pioneers had to protect themselves.



INDIAN SCENES AS AN INDIAN SEES THEM

Looking Elk, Indian artist, at work in his studio at Taos, one of the most popular art centers of America. On the wall is his framed certificate of membership in the National Geographic Society.

A COMBINE HARVESTER ALONG THE SANTA FE TRAIL

In emigrant days much of central and western Kansas was marked on maps as part of the "Great American Desert." But the advent of hard wheat and of power machinery has made this "desert" an agricultural region of enormous productivity.

is an old saying. Tales are told of tenderfeet, misled by the extreme clearness of the atmosphere, into sad misjudgments of distance. There is an old yarn of one newcomer who set out before breakfast to walk to what seemed to him a near-by mountain. At noon, apparently no nearer it than when he started, he came to an irrigation ditch only three feet wide; he sat down and took off his clothes to swim the river!

A SCENIC SIDE TRIP TO STRANGE TAOS

In all America there is no more amazing ride than that trip from Cimarron, in New Mexico, up the canyon of that name, over the 9,500-foot divide, and into ancient Taos. Over this fork of the Old Trail moved much of the traffic for Santa Fe before the Civil War.

Taos is a singular town. Its vast pueblo, or communal house, looks like pictures of lamaseries in Tibet (see Color Plate V). It has only about 2,000 inhabitants now; it had about that many in 1680, when the Pueblos revolted against the Spaniards. It has never had a boom; yet last season more than 85,000 tourists bumped over its unpaved streets.

Indians, galloping by my inn, awakened me at dawn. A topic of town debate on my visit was new hitch-racks for the plaza! And here flourishes a real, old-fashioned country store. It still trades goods for furs—when the Indians have any. "They'll trade for anything, from toys, wild-animal traps, and coffins to calico or threshing machines," a clerk told me.

For its size, Taos may well be the most interesting town in America. Its unspoiled aboriginal life, its odd communal houses, and astounding scenic beauty have inspired an artistic "gold rush," bringing scores of painters and poets to work here. Many have built studios of Pueblo-Spanish architecture, set in charming gardens.

Leading on from Cimarron town, the main Old Trail crosses several small streams and runs on southwest to meet at old Fort Union with that south fork which once took off at Cimarron Crossing, in Kansas. Fort Union, long of importance, is a ruin now. Built as a refuge for Indian-plagued emigrants, it was also the seat of

Photograph by R. L. Campbell

HUNTER AND HOUNDS, WITH MOUNTAIN LION SLAIN IN NEW MEXICO

Stockmen and Federal agents are active in the destruction of these predatory wild animals, which are a menace to live stock in isolated regions. The depredations of one notorious mountain lion during a career extending over a period of 11 years were estimated at $14,000.

a strong garrison and a storage place for army supplies.

A strategic point when Civil War swept the West, Union volunteers hastened through the snow from Denver to save it from Confederates marching up from Texas. Army names famous in history are written in its records, such as Stonewall Jackson and John A. Logan. General Grant came here toward the end of his illness to "feel again the lift of the high mesa, with its illimitable views."

Wagon Mound, not far from Fort Union, is named for a near-by hill which strangely resembles the canvas top of a covered wagon. Its adjacent wet, green valley meadows are popular now with goose-hunters; but time was when men with guns watched for bigger game than geese. Indians jumped a Taos trader's caravan here and his escape is an epic in Indian annals.

As this trader reached Wagon Mound, his carts loaded with furs for the East, "a band of Comanches appeared and made signs of peaceful intentions. But Hatcher, the trader, knowing well their tricks, gave them some sweets and then suddenly seized their chief by his scalp-lock and placed his hunting knife against the Indian's skull. He then ordered the chief to send away his warriors under penalty of being instantly scalped if he refused. It was not until Hatcher began actually cutting into the scalp and blood ran down into the Indian's eyes that he gave in and ordered his men to leave the vicinity."

A HORSEBACK RIDE THAT HAS NEVER BEEN EQUALED

Ox trains, crawling through floating dust, were like slow motion pictures; but all early travel wasn't slow. Army messengers achieved prodigious feats over this trail. There was Capt. Felix Aubrey's astonishing ride, made on a wager, which has never been equaled in the history of horsemanship on this continent. Using relays, he rode from Santa Fe to Westport (Kansas City), 775 miles, in *five days and thirteen hours!*—September 12-17, 1848.

West of Wagon Mound, toward Las Vegas, the Trail crosses the wide Plains, paradise of the cattlemen, and the drainage divide between the Rio Grande and

Mississippi basins. In Shoemaker Canyon, dotted with pines, cedars, and piñons, is a sanitarium built by Chicago department stores as a health resort for employees.

SPAIN'S GIFT TO OUR SOUTHWEST

Time and again through this region proof strikes you that the Spaniards who colonized New Spain were not all mere gold-seekers and adventurers. You have but to regard their early communities which still exist, or even the sites of decayed adobe homes, with their ancient sand-clogged irrigation ditches, hinting at gardens and orchards long gone, to see that they were more than marauders. They introduced many now familiar plants and animals into the Southwest.

The Conquest was not all romance; it had bread-and-butter aspects. As early as 1495 the Spanish had sent chickens, horses and mares, pigs, sheep, cattle, jacks and jennets, as well as millet and other seed, to the West Indies; they also sent gardeners, millwrights, and blacksmiths.

In time they transferred their whole agricultural system to the islands, and then to Mexico and our Southwest. They brought not only plants and seeds, but flour mills, sugar mills, and their system of irrigation and land laws. Father Kino gained his ascendancy over Pimas and Papagos by bringing them domestic animals and new fruits and vegetables. It was into this world of Spanish social forms and economics that the Old Trail led when it ran down into New Mexico from Raton Pass.

THE LAST STOP ON THE LONG, LONG TRAIL

Las Vegas, or "The Meadows," is a striking example of the old and new. What is now the "Old Town Plaza" was the freighters' stockade; here caravans stopped en route to Santa Fe. On the west side of this plaza, brick-faced now and used as an office, stands the small adobe house upon whose flat roof Gen. Stephen W. Kearny stood and first proclaimed the sovereignty of the United States over the vast Southwest that then was Mexico's.

To emigrants and traders, Las Vegas was the last haven on the Old Trail. Once here, they felt that the gravest Indian danger lay behind.

Freight, handled when the advancing railhead reached Las Vegas, made this a busy frontier trading post. From the big ranches of the Carlsbad and Roswell country, more than 200 miles away, wool was hauled here. Then Las Vegas called itself the greatest raw wool market in the world.

As a railway division point, it still serves a large territory of ranches, mines, and lumber mills.

If all the people in New Mexico and Arizona formed in line, they would hardly half equal the number of tourists who ride over this trail every year; and many a cruising cross-continent motor pilgrim, "holding her steady at 45 an hour," never suspects how much this history-soaked section had to do with shaping our map.

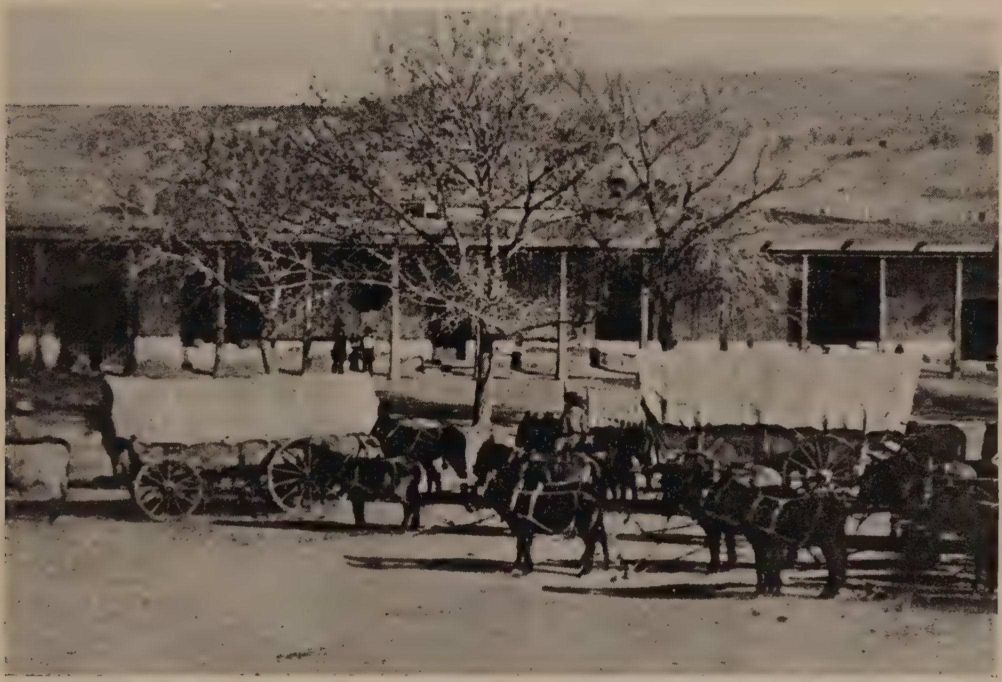
THROUGH ROMANTIC GLORIETA PASS

Ahead are Glorieta Pass and Apache Canyon. If in 1846 the Mexican army under Armijo had defeated Kearny here, instead of retreating and leaving his path open to Santa Fe, the western frontier of the United States might still run along the Arkansas River, with Mexicans ruling over the Southwest and California. Picks and steam whistles echo now, on near-by Willow Creek, where Apaches used to lurk, and a great aërial tramway carries lead and zinc 12 miles, from mine to mill.

Displaying now to the curious such relics as flintlocks, ox yokes, and bear traps, the old Glorieta Indian trading post and stagecoach station, with its crumbling adobe corral, hints mutely at the romance and adventure of other days. Here, *gracias á Dios,* was the last stop on the long, long trail! But a few miles more, winding over red earth, among green cedars and juniper, the path leads down to Santa Fe!

Except for the chimneys of the penitentiary, you can't see the town, because of the terrain, till you're right at it. It was down this last hill, in prerailway days, that freighters and stagecoach drivers came with happy whoops and a final spurt of speed. Shaven and dressed in their best, with new lashes in their whips to make them pop loud, they brought their wagon trains into Santa Fe like a circus into a country town.

"Los carros! Los Americanos! La entrada de la caravana!" Such were shrill



Photograph from Mrs. James A. Rolls

WHEN THE WEST WAS YOUNG

These covered wagons halted nearly fifty years ago in the plaza at Santa Fe. This is among the rarest historical photographs of the Old Trail days.

cries raised by excited Mexican women and children as the rattling wagons came to rest in the old plaza. With duties paid at the customhouse, came sale or barter for the owners of the trade goods, and for the drivers and hangers-on wild days and nights of fandangos, with drinking, carousal, barbaric abandon.

WHERE THE STARS AND STRIPES WERE RAISED BY KEARNY

Facing the shady plaza stands the ancient Palace of the Governors, where Pike was imprisoned. From it, for centuries, Spain gave law to this part of America, till Kearny raised the Stars and Stripes, on August 16, 1846.

"New Mexicans! We have come among you to take possession of New Mexico, which we do in the name of the Government of the United States. We have come as friends, to better your condition, and to make you a part of the American Republic. . . ."

So spoke General Kearny, ratifying the heroic work begun by Pike, Becknell, Kit Carson, Bent, St. Vrain, Gregg, and Marmaduke years before President Polk sent Zachary Taylor to the Rio Grande. America was in the making. Soon, by treaty, we gained practically all of the present New Mexico, Arizona, the southwest parts of Kansas and Colorado, Utah, Nevada, and all of California—California, from which in a few short decades a President of the United States was to come!

A path to empire! It passed Santa Fe, eventually toiling on to the Pacific. It branched north and south, and carried millions in men and goods to Eldorado. Trappers, traders, freighters, stagecoaches, the pony express—then railways and airplanes.

Santa Fe, City of the Holy Faith, well established when the Pilgrims landed, feasted the buckskinned beaver trappers and bartered leisurely when the traders came. It looks up now idly as the airplanes pass, or rides them if the spirit moves. But it is still Santa Fe. American by treaty, it clings to Spanish culture. In its Corpus Christi parade the Archbishop marches with leading citizens, halt-

Photograph by Edward Kemp

GIRL GUIDES PILOT TOURISTS THROUGH INDIAN TOWNS AND TO THE SCENIC MARVELS OF NEW MEXICO

Their combined knowledge, from intensive drill in the history, legends, ethnology, archeology, and industry of the Santa Fe country, leaves them undismayed even at such questions as "How do you speak Spanish?" and "What do Indians think about?" They serve a Santa Fe transport company which handles armies of Old Trail tourists every year.

ing to say prayers as incense swings in little shrines built before the homes of the faithful. It builds still with adobe and bakes bread in outdoor ovens of mud; it goes early to mass and wots not of booms. Spanish is used in the courts and children of both races speak it at play.

Art colonies it has and writers of fame. Its old Fonda, where Carson and Kearny lodged, is grown up now, a gorgeous Moorlike palace of yellow mud and carved beams, wherein the decorator has made her noble experiment and alien musicians in bright costumes play dreamy music of Don Quixote's land.

Tourists swarm like hungry locusts in green fields, for here is something different; in all America no spot is like it. More has been painted, sung, and written about Santa Fe than any other city its size in the United States. Spanish travelers were writing home about it three centuries ago!

But Santa Fe, like Rome or Samarkand, is a story in itself. It is the end of the Trail.

INDEX FOR JANUARY-JUNE, 1929, VOLUME READY

Index for Volume LV (January-June, 1929) of the National Geographic Magazine will be mailed to members upon request.

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GEOGRAPHIC
MAGAZINE

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INTO PRIMEVAL PAPUA BY SEAPLANE

Seeking Disease-resisting Sugar Cane, Scientists Find Neolithic Man in Unmapped Nooks of Sorcery and Cannibalism

BY E. W. BRANDES, PH. D.

Principal Pathologist-in-charge, Sugar Plant Investigations, and Leader of the New Guinea Expedition

IF TO-DAY a stone-age man appeared naked on Broadway, armed with spear and shield or carrying the severed head of a tribal enemy, he might block traffic; for he vanished, in the popular mind, with mastodon, mound builder, and saber-toothed tiger. Newspapers print the item now if a peasant plowman in France merely turns up an ancient stone ax or a tooth necklace, relics of those who toiled, fought, and died before Babylon was built or Moses got stone Tablets of the Law.

Now it is only from wax figures in museums that we commonly get any hint of how our neolithic ancestors lived. There, in glass cases, we see them making tools of polished stone for chopping out their canoes, or for planting haphazard gardens in jungle clearings. "Think of making a boat with no tool but a sharp rock!" one hears museum visitors exclaim. "What a difference the centuries make! Wouldn't primitive man be astonished if he could see us now, with our radio, our high-power rifles, and flying machines!"

NEOLITHIC MAN STILL WALKS THE EARTH

I can say that he would. Moreover, he was!

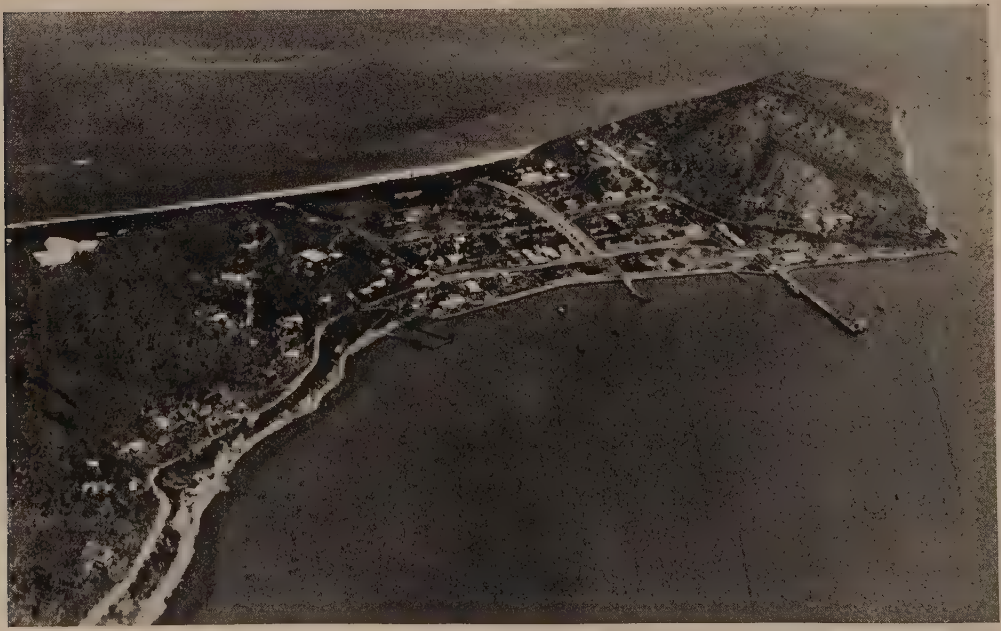
For the bald truth is that neolithic man has not vanished entirely. In certain far nooks and crannies of the world he lives now just as primitively as he did uncounted thousands of years ago. I found him just so when I alighted from a plane before a cannibal camp in the remote jungles of New Guinea and was mistaken for a god!

When his first panic was over, I had a chance to study him at work and play. So it came that I saw him fashion his rude stone ax, and tip his arrow with the hard, sharp, bony toenail of a cassowary. He wanted to trade me smoked human heads for old safety-razor blades or empty cigarette tins. To him I, in my "big hawk," as he called it, with my odd clothes and mysterious weapons, was as much of a curiosity as he would be to us should he come now to Broadway. Perhaps even more so; for in all probability he had never even heard of a white race.

Ours *was* a queer experience. Put yourself in our place: face to face with naked wild man at the very dawn of reason, barely groping as yet from brute instincts and abysmal urges, his elemental appetite as yet untempered by the softening conventions of the life struggle as we know it.

In the weeks that we spent with him, how grimly his primitive manners and

ALL HULA WANTED TO INSPECT THE EXPEDITION'S SEAPLANE (SEE, ALSO, PAGE 256)

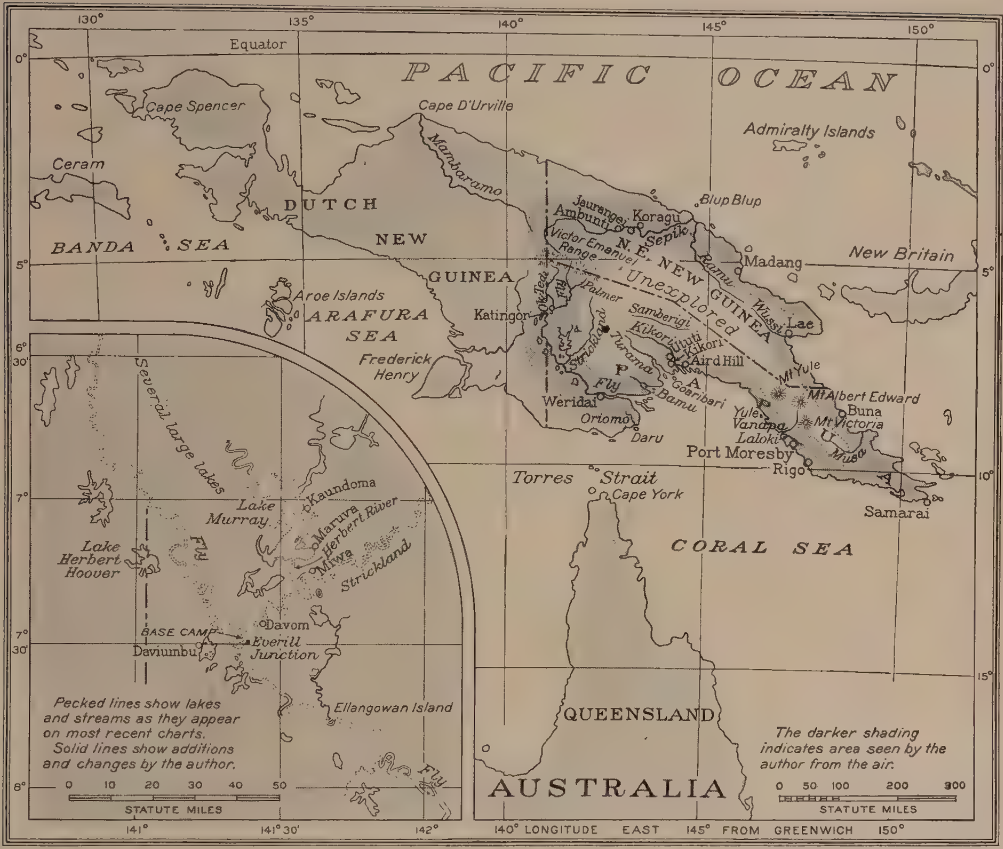


Photographs by R. K. Peck

LOOKING DOWN ON PORT MORESBY, CAPITAL OF PAPUA, FROM AN ELEVATION OF 10,000 FEET

On the slope of a hill at the left is a rain-water reservoir, built because of long dry seasons. It was at Port Moresby that the Expedition made its final preparations for the work in the interior.

VERTON HIGH SCH


PACIFIC OCEAN
Equator
Cape Spencer
Ceram
Cape D'Urville
Mamberamo
Admiralty Islands
DUTCH NEW GUINEA
BANDA SEA
Jaurenge
Ambunti
Koragu
Blup Blup
Sepik
Victor Emanuel Range
N. E. NEW GUINEA
Unexplored
Madang
New Britain
Ramu
Lae
Aroe Islands
ARAFURA SEA
Katingor
Palmer
Samberigi
Kikori
Aird Hill
Frederick Henry
Fly
PAPUA
Weridai
Oriomo
Daru
Bamu
Turama
Goaribari
Yule
Vanapa
Laloki
Port Moresby
Rigo
Mt Yule
Mt Albert Edward
Buna
Mt Victoria
Musa
Samarai
Torres Strait
Cape York
CORAL SEA
QUEENSLAND
AUSTRALIA
The darker shading indicates area seen by the author from the air.
0 50 100 200 300
STATUTE MILES
140° LONGITUDE EAST 145° FROM GREENWICH 150°
Several large lakes
Lake Murray
Kaundoma
Maruwa
Herbert River
Miwa
Strickland
Lake Herbert Hoover
Fly
BASE CAMP
Davom
Everill Junction
Daviumbu
Ellangowan Island
Pecked lines show lakes and streams as they appear on most recent charts.
Solid lines show additions and changes by the author.
0 10 20 30 40 50
STATUTE MILES
141° 141°30' 142°
130° 135° 140° 145° 150°
0° 5° 10° 15°
6°30' 7° 7°30' 8°

Drawn by A. H. Bumstead

A MAP OF NEW GUINEA AND (INSET) A SKETCH OF THE TERRITORY IN WHICH THE AUTHOR MAPPED NEW LAKES AND CHARTED NEW RIVER COURSES

While the chief object of the New Guinea Expedition was to find new varieties of sugar cane, in their seaplane the members saw and were able to chart, by means of aërial photography, a large area, parts of which had never before been visited by white men. The dark-shaded area, comprising the greater portion of the eastern half of the island, is the part covered during the 57 flights by the Expedition's seaplane. New Guinea is the second largest island on earth, Greenland alone exceeding it in area. The western half of the island is a Netherlands possession; the eastern half is divided into two parts—the southern half, the Territory of Papua, is an Australian dependency; the northern half, formerly a German colony, Kaiser Wilhelm's Land, is now administered by Australia under a mandate from the League of Nations. North East New Guinea is the mainland of the mandate; the remainder includes the Bismarck Archipelago (New Britain, New Ireland, and Admiralty Islands) and a portion of the Solomon Islands group. The inset map, showing the Fly River basin, covers 11,000 square miles.

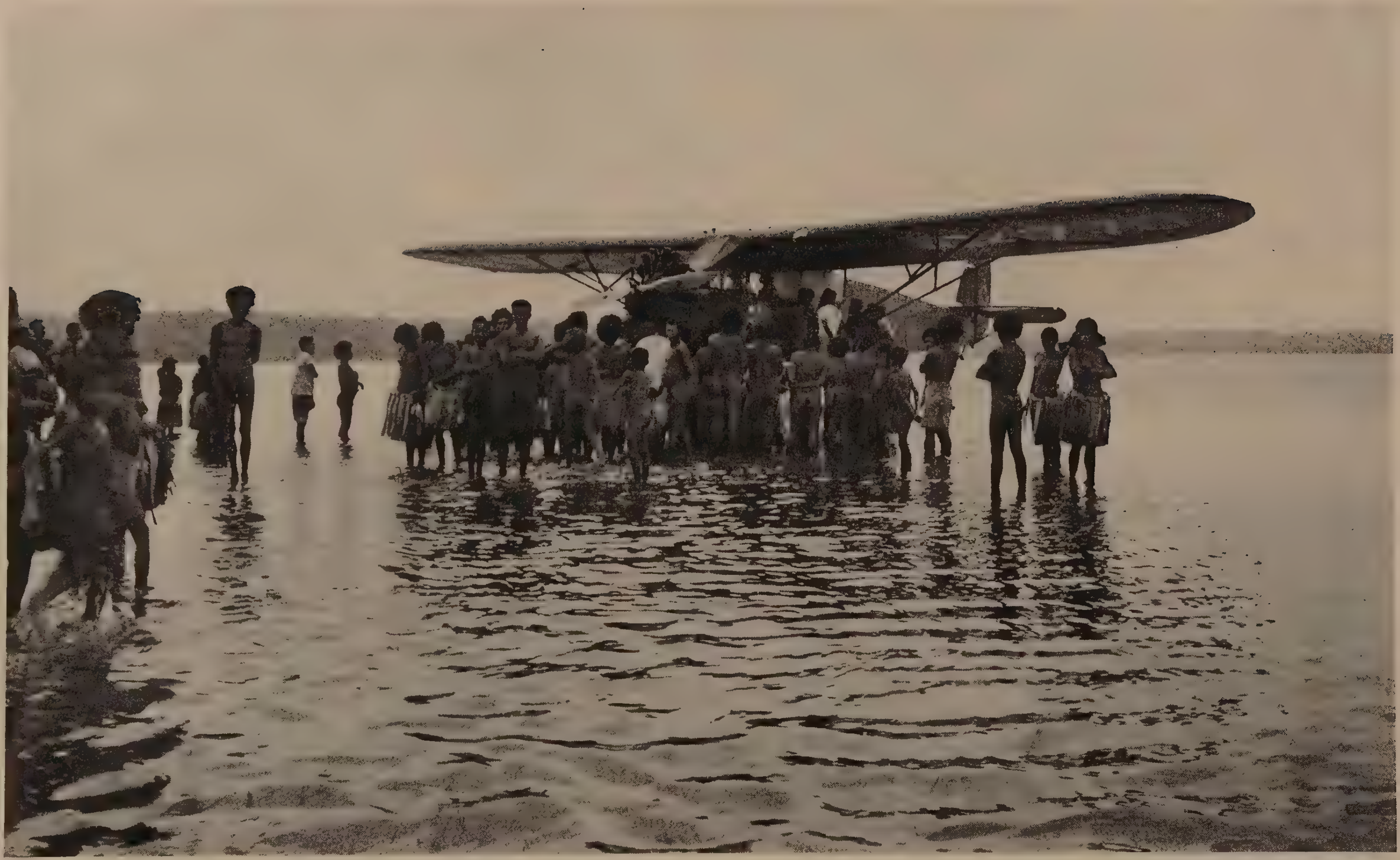
habits reminded us of what our ancestors once were actually like, and of what a long, hard struggle man went through on his magnificent moral climb from savagery up to civilization!

FLYING OVER UNMAPPED NEW GUINEA

Startling it was, also, when now and then we saw these wild men act exactly as we ourselves still act when under the stress of fear or great excitement. In such moments of panic, we had to admit, there is not, after all, such a wide gulf between savage and civilized man.

The world's second largest island, New Guinea is called. Fifteen hundred miles long, it sprawls just below the Equator, in the western Pacific. About its high mountains terrific rainstorms rage, sending its rivers roaring across its vast lowlands in floods of Mississippilike proportions.

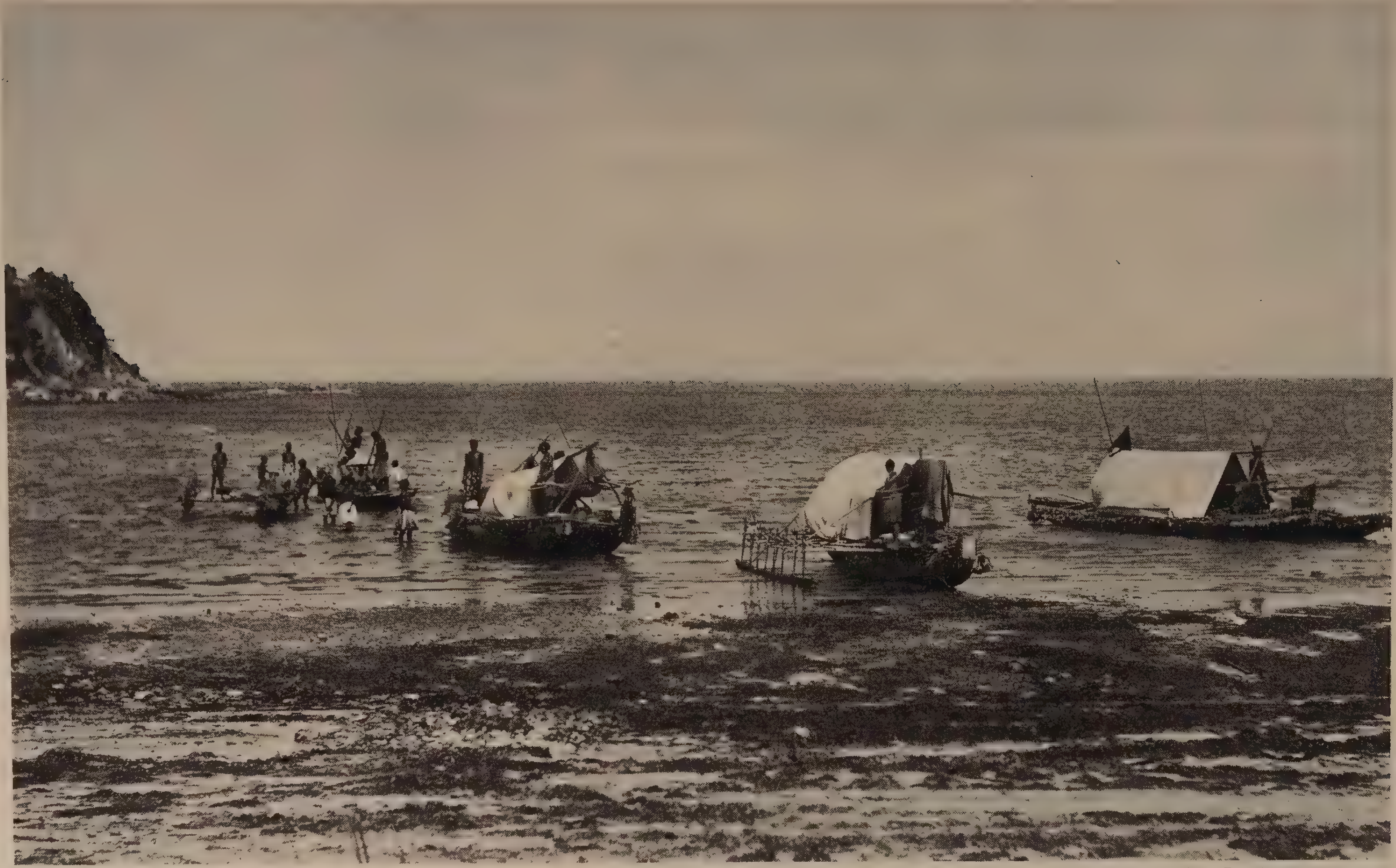
Here and there about the island's rim a



Photograph by R. K. Peck

CURIOUS NATIVES OF HULA WADE OUT TO VIEW THE FLYING MACHINE

Although these people, living near Port Moresby, long have been in contact with civilization, they made propitiatory offerings of food to the strange monster.



Photograph by Dr. E. W. Brandes

PAPUANS MAKE VOYAGES OF 100 MILES OR MORE IN THESE CRAFT

In their outrigger seagoing canoes (see, also, illustration, page 273) the natives arrive at Port Moresby to trade or "sign on" as laborers.

Photograph by Dr. J. Jeswiet

PREPARING A HILLSIDE FOR A GARDEN

In the mountains back of Rigo these natives are building crude fences or wooden stockades to protect their crops against the raids of bush pigs and wallabies.

few white traders, miners, and planters have gained a foothold. And yet, though it lies hard by the steamer lane from London to Sydney, its dark, evil interior is almost as little known now to the world at large as when daring Pacific explorers—Portuguese, Spanish, Dutch, French, and English—first cruised past its hostile shores centuries ago.

Time and again, in the 57 flights, totaling more than 10,000 miles, which we made over its often unmapped lakes, jungles, and ranges, we realized how much exploring and surveying have yet to be done there before white men can really know all the truth about New Guinea and its less than a million human beings who people this island, which is nearly three times as large as the British Isles. A strange land it is, of coconuts, cannibals, and sorcery; of gorgeous birds of paradise and wattled cassowaries; of mountains, and of swamps alive with crocodiles, carpet snakes, leeches, and mosquitoes.

TO NEW GUINEA IN SEARCH OF SUGAR CANE

It was for the U. S. Department of Agriculture that our small expedition was sent to New Guinea. We went primarily to seek a disease-resisting sugar cane, to revive a sick industry in our own Southern States.

To Canberra, new capital of Australia, we went first, for without the generous aid and coöperation of that commonwealth's officials our exploration in Papua and the mandated Territory of New Guinea could never have been undertaken. Nor shall we ever forget the hearty hos-

Photograph by Dr. J. Jeswiet

SOME OF NEW GUINEA'S PLANTS ARE AS SAVAGE-LOOKING AS THE ISLAND'S HUMAN INHABITANTS

In a swamp a few miles from Port Moresby stands this sago palm, with its odd aërial roots. Here, also, in deeper water, grow water ferns and huge Erythrina trees, whose floating, branched roots are clad with innumerable hairs, apparently for respiration.

pitality and the unselfish assistance extended to us by that patient, courageous group of Australians who are bearing the white man's burden on that vast and rich, but as yet untamed, isle.*

The party included Dr. Jacob Jeswiet, Dutch sugar expert and world authority on the improvement and culture of the sugar-cane plant; Mr. C. E. Pemberton, a seasoned explorer who has spent much of his life seeking in remote places for parasites of sugar-cane insect pests for the Hawaiian Sugar Planters Association; and Mr. Richard K. Peck, airplane pilot, of Elgin, Illinois, a veteran of the Stirling Expedition to Dutch New Guinea in

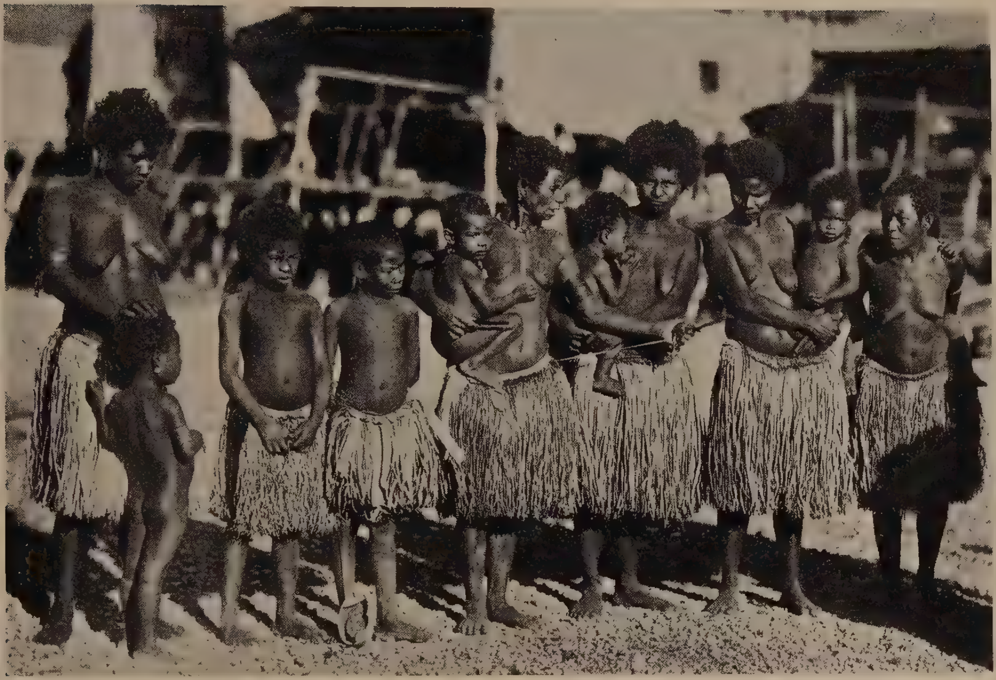
* Among the host of friends, both individuals and institutions, who contributed to the success of our enterprise, Mr. Bror G. Dahlberg, of Chicago, who furnished the seaplane, and the tactful representatives of his company in Australia, whose assistance in securing an official hearing for our enterprise was indispensable, played leading rôles. To the officials of the Colonial Sugar Refining Company of Sydney, who cared for our collection of cane varieties, a duplicate set of which was planted at Sydney, grateful acknowledgment is due. The Australian Prime Minister, the Right Hon. Stanley Melbourne Bruce; the Lieutenant Governor of Papua, Sir J. H. P. Murray; the Acting Administrator of Papua, the Hon. Staniforth Smith; the Administrator of the Territory of New Guinea, Brig.-Gen. E. A. Wisdom, and, last but not least, Australia's war-time Prime Minister, Mr. "Billy" Hughes, all extended courtesies and essential aid far beyond what we could reasonably have hoped for.

THREE ALERT WOMEN FROM THE VILLAGE OF HULA (SEE PAGES 254, 256, AND 272)

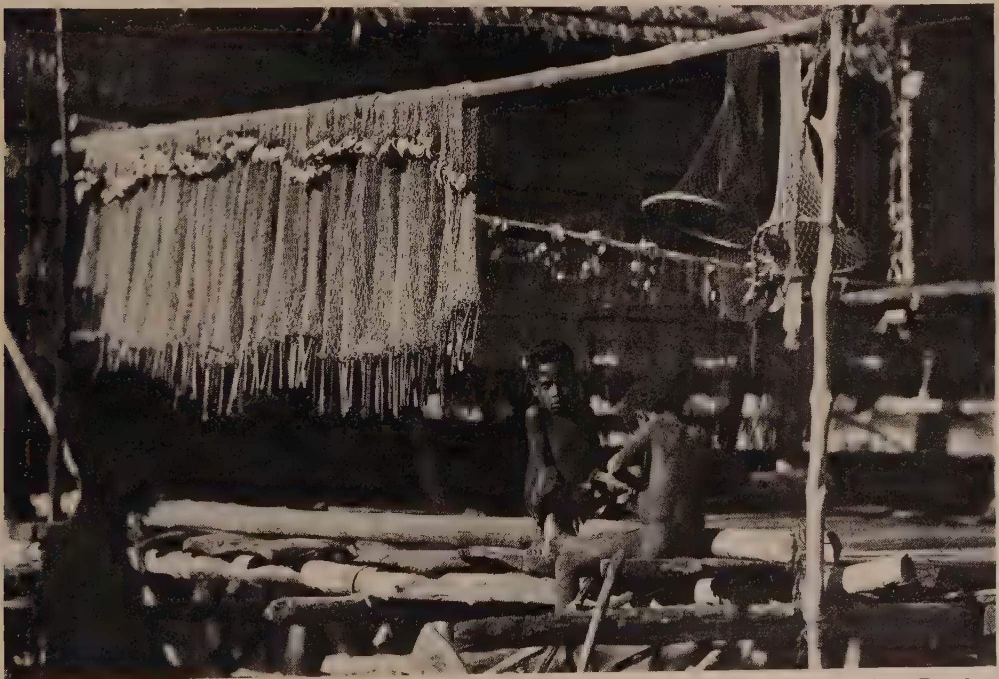
Photographs by Dr. E. W. Brandes

NEAR WHITE SETTLEMENTS, SCHOOLS FOR NATIVES HAVE BEEN ESTABLISHED

Among these mission pupils at Elevala (see pages 265 and 277), two are seen with books. Many native children speak fair English and play cricket and football with much enthusiasm.



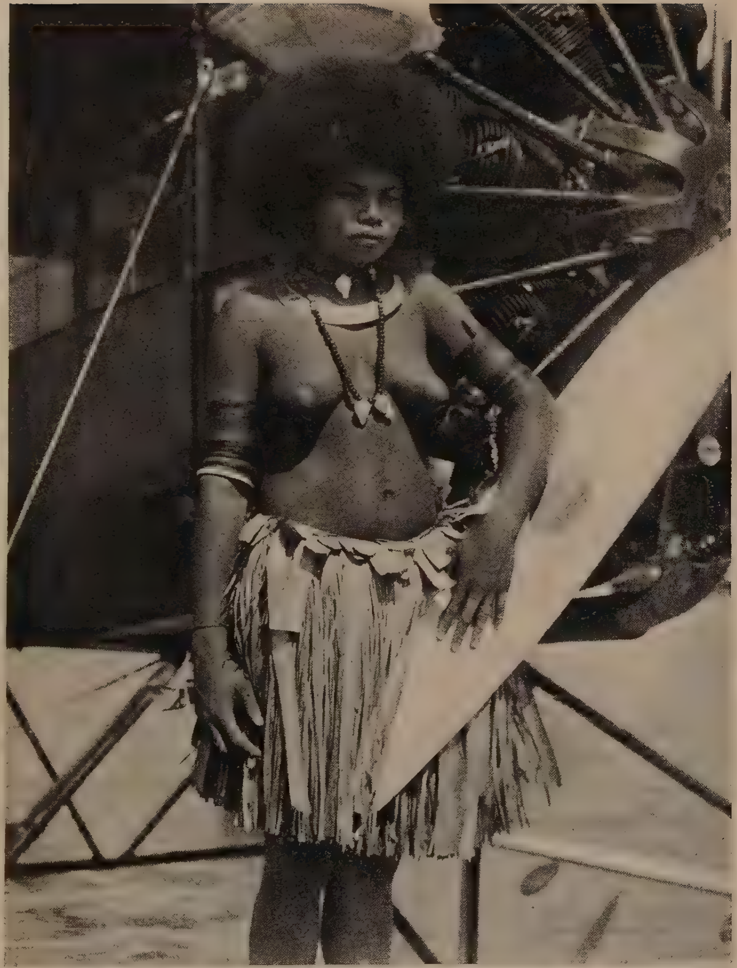
SMALL FAMILIES ARE THE RULE IN PAPUA: MATRONS OF ELEVALA AND THEIR BABIES

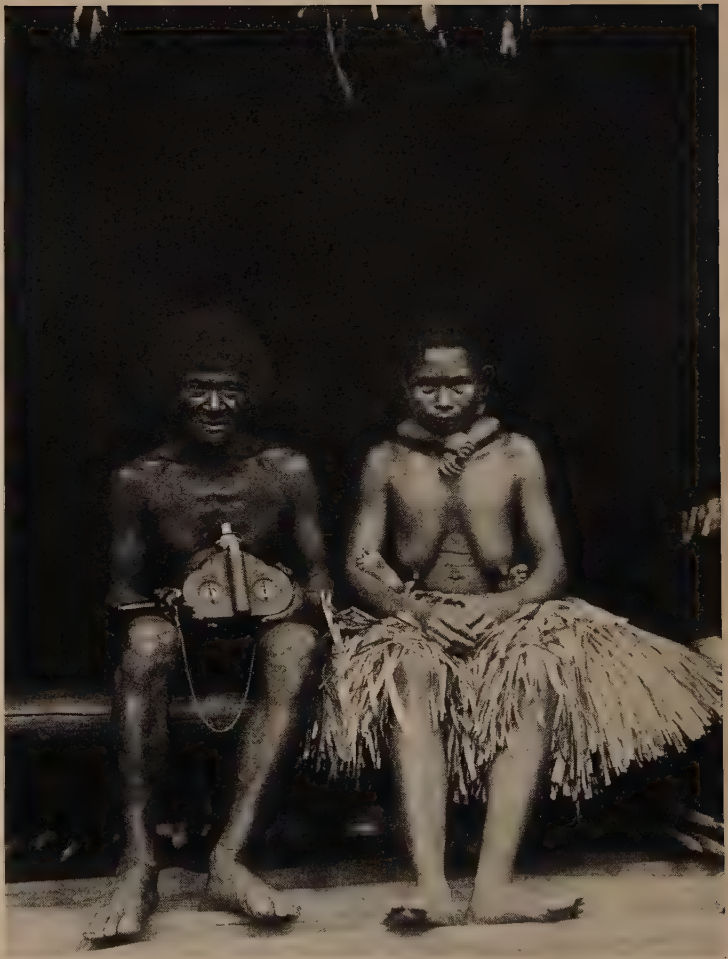


Photographs by Dr. E. W. Brandes

FISH NETS USED BY PORT MORESBY NATIVES

All coastal natives of New Guinea are expert fishermen. Remote as they are from civilization, they make nets similar to those used in other seas (see, also, text, page 272).





Photographs by R. K. Peck

AVIATION INTERESTS WOMANKIND EVEN IN NEW GUINEA

This robust young Melanesian woman from the village of Hula (see, also, pages 254 and 256), with her huge mop of frizzly hair, is of the type found along the southeast coast of the island.

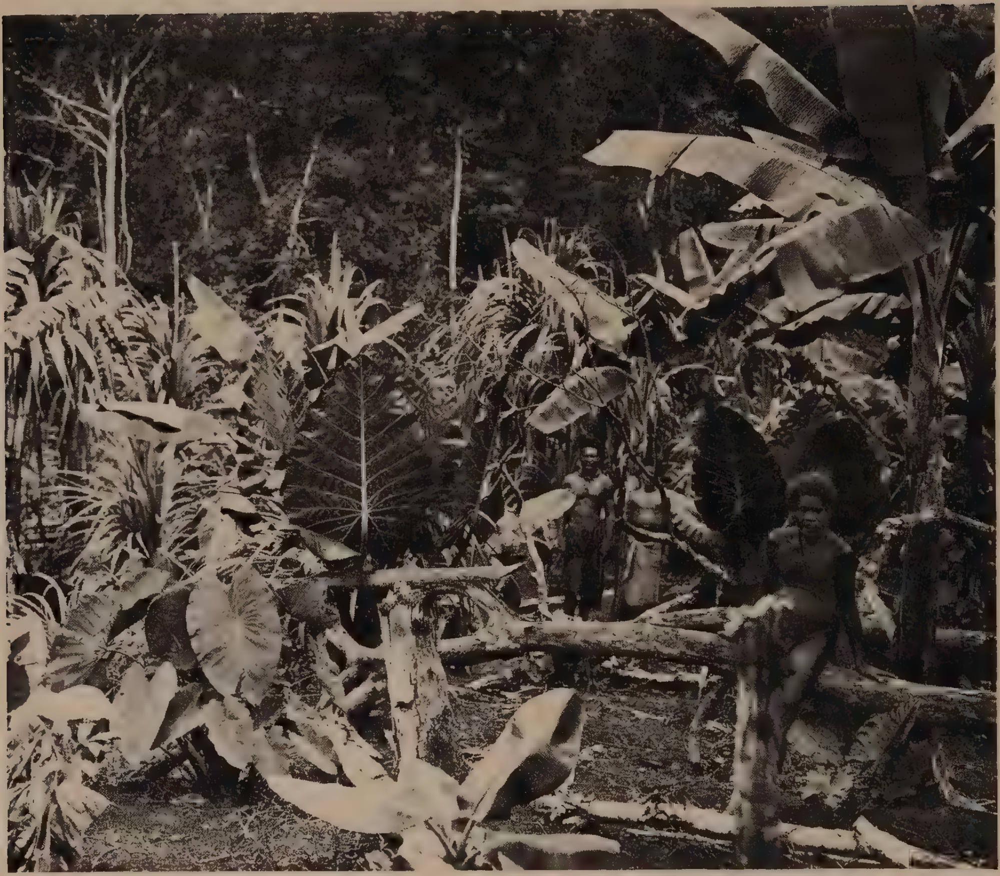
MAN AND WIFE POSE FOR THEIR PICTURE

He was fascinated by the whir of the motion-picture camera and wanted to examine its machinery. Clasped about the woman's neck are the arms of her infant. The family lives near Port Moresby.

Photograph by Dr. E. W. Brandes

TWENTY MILES FROM PORT MORESBY, OVER THE ONLY STRETCH OF IMPROVED ROAD IN ALL PAPUA, THE TRAVELER REACHES RONA FALLS

The main leap of this impressive cataract of the Laloki River is from 80 to 90 feet. While its hydroelectric possibilities are considerable, there is no prospect of its early development, for the largest city in Papua, Port Moresby, has only 300 white inhabitants.



Photograph by Dr. J. Jeswiet

DESPITE CRUDE IMPLEMENTS, PAPUANS CULTIVATE MANY PLANTS

In a forest clearing near Rigo grows this garden, in which are grouped, in disorderly fashion, taro, cane, yams, and bananas (see, also, text, page 271).

1925-26, to whose skill and judgment we owe much of the success of the Expedition.

THE FIRST FLIGHT

To Samarai, a tiny island off the southeast tip of New Guinea (see map, page 255), we shipped our seaplane when full official sanction of our agricultural adventure was granted; and it was from Samarai, our plane duly lowered to the sea and fueled, that our first flight of inspection to Port Moresby, our main base of supply, was made. Cheered by a farewell toot from the steamship *Montoro,* Peck and I took the air and headed for "Port," as the island's biggest white colony is called.

The 260-mile flight along the southern coast from Samarai to Port Moresby hinted at the scenery we were to enjoy for the next three months—an amazing panorama of submerged coral reefs, palm-fringed beaches, and wooded hills, terminating far inland in majestic peaks mantled in swirling mists.

Birds floated lazily among tree tops, and in the clear blue waters sharks could be seen stealthily nosing their way among the reefs. Native villages nestled on promontories, with well-beaten pathways meandering back to garden patches cleared in the jungle.

Now and then we saw geometric plantings of coconuts over wide coastal areas, each with its neat plantation house of European design and its own private sailing vessel anchored in a sheltered cove adjacent to it. We descended for a close look at a platformed seagoing double ca-

Photograph by Dr. E. W. Brandes

NIPA SHACKS AT ELEVALA (SEE, ALSO, PAGES 260 AND 277)

noe with "crab claw" sails, much to the alarm of its native crew, who frantically tried to get away.

This shore line east of Port Moresby is cut by deep bays, safe refuge for small craft. We passed broad, black mangrove swamps crossed by serpentine rivers pouring chocolate-colored water into the blue Pacific. On our maps many of these rivers were shown much straightened out, free of the oxbows, bends, and kinks which they actually achieve, as seen from the air. Often, too, these rivers abandon their beds and take new courses.

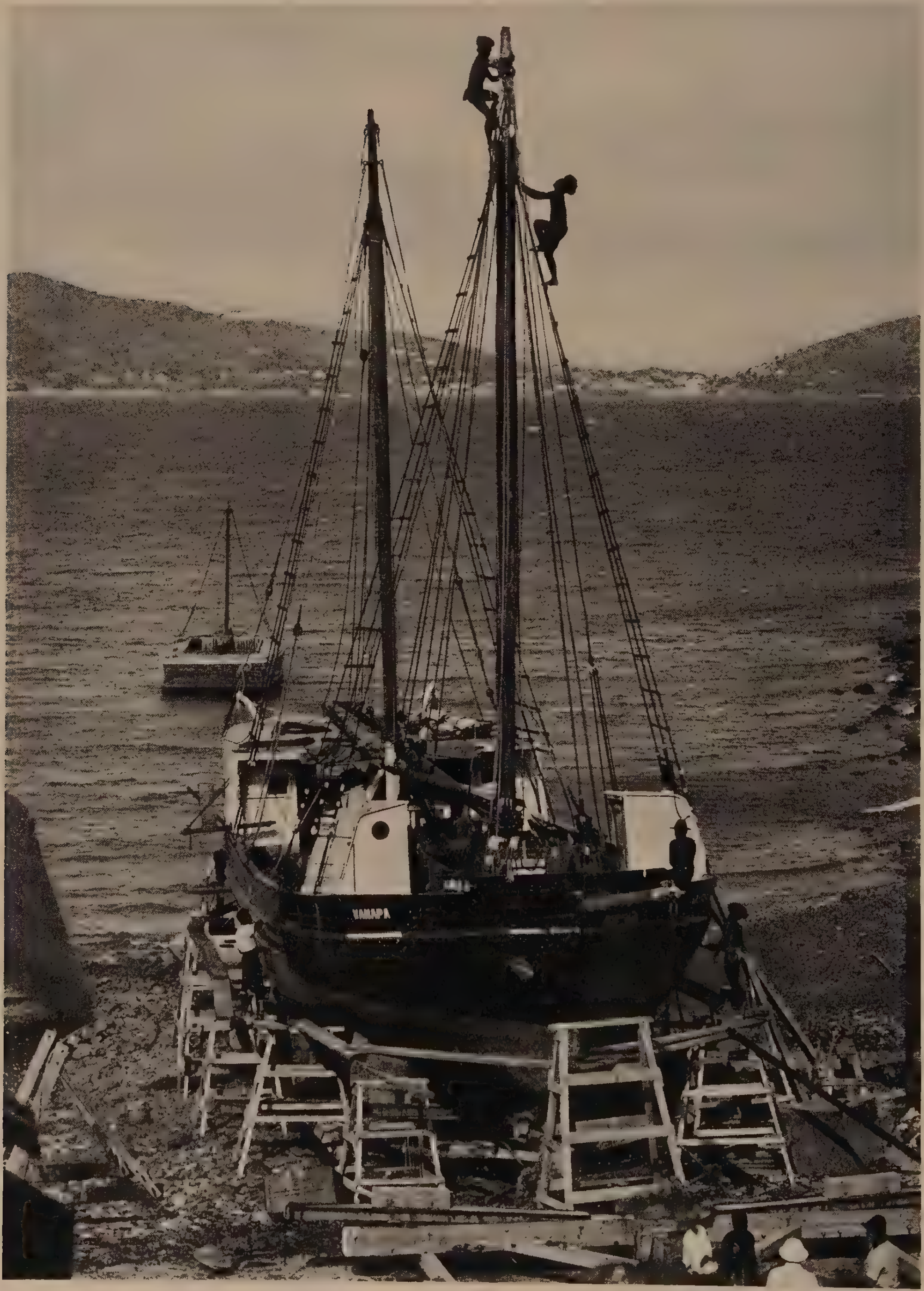
VILLAGES BUILT ON STILTS OVER WATER

Nearing Port Moresby, we saw villages that were built over the sea—brown-thatched houses poised like spindle-legged "water striders" upon the waves (see illustrations, pages 277 and 279). Originally designed for protection of maritime villagers against bloodthirsty hill tribes, this style of city planning is now encouraged by the Government for sanitary reasons. To each house is tethered its dugout canoe, apparently still ready for any emergency.

The parched hills about Port Moresby came now into view. Soon we raised the clean-looking town between two hills of an elevated peninsula that almost completely locks the harbor from southeast trade winds. The peak of the landward hill is capped with a large field of corrugated sheet metal, the contour of which is designed to catch and direct rainwater into a large, covered, concrete reservoir, which provides water for use when the ordinary roof tanks go dry.

Port Moresby had a population of about 300 whites during our sojourn. Most men are in Government service or trade.

Its chief exports are copra, rubber, copper, gold, bêche de mer, or trepang (a sea



Photograph by Dr. E. W. Brandes

THE "VANAPA," SUPPLY SHIP OF THE EXPEDITION, BEING OVERHAULED OPPOSITE PORT MORESBY

Some of the coast men of New Guinea make good sailors. Here the *Vanapa's* mop-headed crew is calking, painting, and overhauling gear, making the vessel ready for its first cruise up the Strickland River (see text, opposite page).

Photograph by Dr. E. W. Brandes

PILOT PECK, MR. IVAN CHAMPION, A PAPUAN GOVERNMENT OFFICIAL, AND AN AMERICAN WOMAN ARTIST

Much to the surprise of the members of the cane-hunting expedition, a young American artist and her companion suddenly appeared aboard the supply boat *Vanapa* after it had left Port Moresby. The two women accompanied the party up the Fly River as far as Everill Junction and remained at the base camp two days. They were jokingly referred to as "stowaways" by the members of the Expedition, but they had paid the captain of the ship passage money for their adventurous voyage (see text, page 285).

slug exported to China, where it is esteemed a delicacy in making soups), pearls, and trochus shell. Luggers engaged in the pearling industry are licensed at Daru, but as the Queensland boundary extends in these waters to within a few miles of the Papuan coast, most of the pearls and pearl shell obtained by them are not credited to the Territory of Papua.

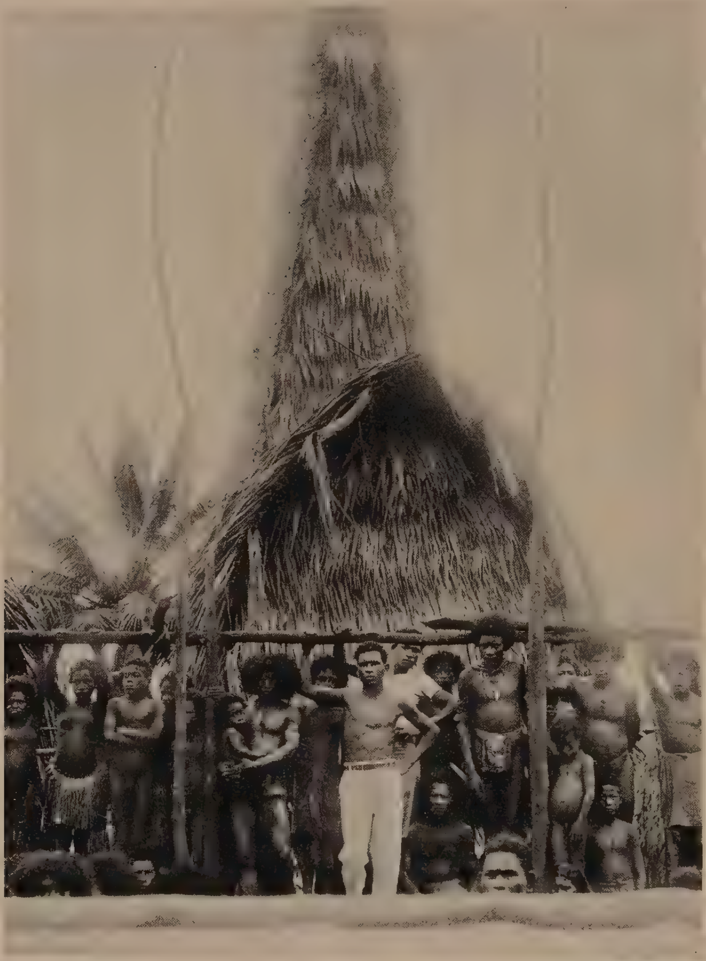
OUTFITTING AT PORT MORESBY

We spent the ten days in Port outfitting and supplementing stores shipped from Australia and America. We chartered an auxiliary ketch, the *Vanapa*, of about 100 tons burden, to transport most of our men, our fuel, supplies, and scientific instruments to some yet-to-be-found point on the Strickland River, which would later become our first base camp. In general, we had decided on the left bank of the Strickland River, above its juncture with the Fly, in a mysterious region regarded by coast folk with superstitious awe.

Those on board included Ivan Champion, now Assistant Resident Magistrate, and a detachment of native police, detailed by the Government to guard us.

Camp making and direction of transport was in the hands of a wandering son of California, Mr. Roy Bannon, who reached this far strand years ago. In his charge were the signed-on "boys," including Gano, the cook; Euki, a reputed wash-wash boy; Emere, a slight, furtive individual, chosen, because of his lack of weight, as "crew of airplane"; and Nape, my personal boy, truculent, but a straight, well-muscled fellow, clever with bow and arrow.

On board, also, were 1,150 gallons of aviation gasoline in 10-gallon drums, tons of tinned food and rice, 3 portable boats with outboard motors, 6 wall tents and 30 tent flies, and the usual complement of



Photograph by R. K. Peck

THIS TEMPORARY THATCHED "STEEPLE" CELEBRATES THE BUILDING OF A NEW HOUSE

A Hula "town boy," in white trousers and with civilized haircut, stands in the foreground.

cots, blankets, fine-mesh sleeping nets, arms, ammunition, hospital goods, and an assortment of scientific supplies, including still and motion-picture cameras.

To the accompaniment of somewhat blasphemous observations by the skipper, the *Vanapa's* sputtering motor finally sensed its master's voice and started. In a downpour of rain the little vessel nosed out through the inlet into a half gale and disappeared from our view.

WE EXPLORE THE DELTA DIVISION

With our other scientists, I remained in Port Moresby, utilizing the three weeks required by the *Vanapa* to reach our base camp to make air trips to various rivers on the south coast.

These first trips were all made from Port Moresby as a base, and we did not fly more than 250 to 300 miles away from Port in a direct line, nor did we remain out more than three days, on account of the limited food supply that could be carried.

One visit was made to Kikori, the Government station of the Delta Division. It stands on the Kikori River, about 30 miles inland. This coast country for more than 100 miles is low and flat. For the most part it consists of innumerable river deltas. Large areas are covered by mangrove and sago palm swamps.

Sago is the staff of life for natives who dwell in the tidal marshes, in houses standing on piles above the morass. Generally the villages are situated on the banks of sluggish streams.

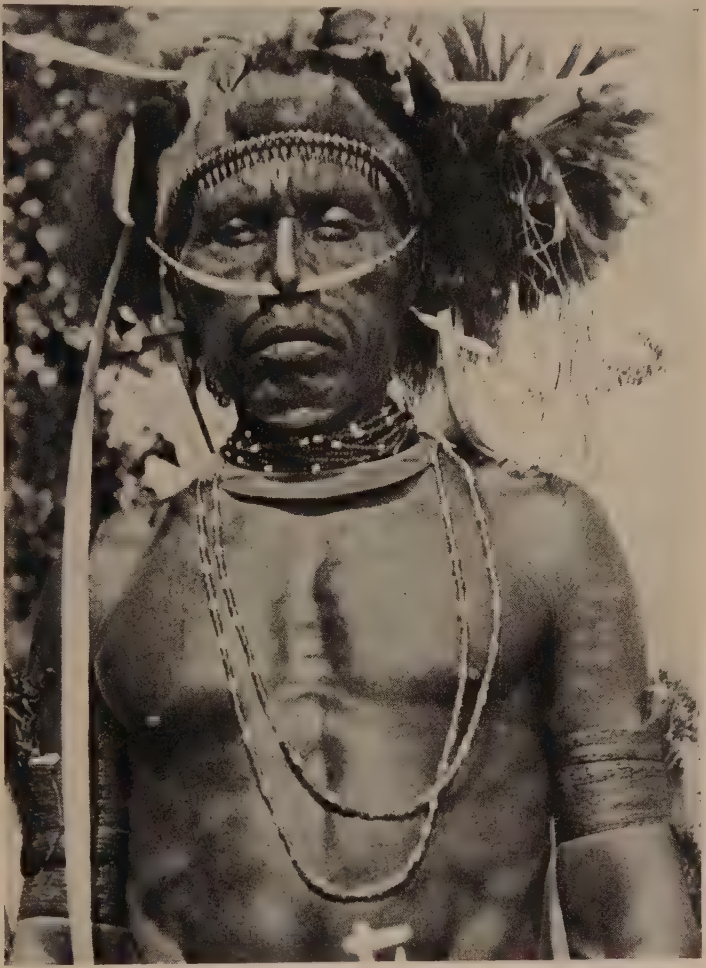
The houses themselves are "distinctive," to borrow from a Western salesman's vocabulary, having a huge, gaping entrance extending from floor to ridgepole. The men's "clubhouses" may be several hundred feet long, low at the rear, but rising to an overhanging peak 50 or 60 feet high in front; their resemblance to a snake with wide-open jaws is remarkable.

The social arrangements and material culture in this part of Papua are interesting.

Although promiscuous mating still occurs during the observance of certain ceremonies, in which many villages may participate, marriage is old among these Delta people and is the basis of family and clan life. Parents may make marriage plans for their children, but these juvenile betrothals are apparently tentative, pending the decision of the children themselves when they attain years of discretion.

LACK OF WOMEN PREVENTS PRACTICE OF POLYGAMY

In case the marriage does not take place, any payments of ornaments or other articles made by the boy's parents are returned by the family of the girl. No feasting or other ceremony is observed at a marriage. The price paid for the bride is not ruinous—just a few arm shells or other ornaments, a pig or a dog. A bride may leave her husband, but then all payments must be returned. While the affair may appear quite mercenary, it is observed that a certain degree of consideration is given to the inclination and wishes of the girl, both before and after marriage.



Photograph by Alfred Gibson

HE DRIVES A BUS IN PORT MORESBY

His nose ornament, made from a big clamshell, is worn only in ceremonials—not while he is pursuing his occupation of chauffeur.

The only deterrent to polygamy is the lack of women, which in parts of New Guinea is due to female infanticide. As it is, about one-fourth of the married men in this area have more than one wife and some have a half dozen or more.

This results in a fairly large proportion of young bachelors, who dwell in the *ravi,* or men's clubhouse. The married men also repair to the ravi at intervals, for the sake of a little peace and quiet or to participate in feasts.

The medium of exchange in this part of the island is the arm shell, a section of the shell of a sea snail, cut and finished so that it forms an armlet or bracelet two or three inches wide. Other durable ornaments are also used, such as dog and wallaby teeth and disks or rings cut from pearl shell; but usually commodities are bartered directly.

CLOTHING IS NEGLIGIBLE OR NON-EXISTENT

Dress is a simple matter. Boys up to about ten and girls up to six wear nothing. A man wears a small band of tapa cloth; one end hangs as an apron. Women's

Photograph by Dr. E. W. Brandes

CARPENTERS SKILLFULLY SHAPE A DINGHY FROM A LOG, ON THE BEACH NEAR PORT MORESBY

The inside of the boat is not burned out, but laboriously chipped away.

dress consists of a band of strawlike material made by shredding sago leaves. It is held in place by a fiber string or bark belt around the waist, and the two loose ends are tucked up under the belt at the rear and project backward like a tail. Very old men go naked.

A MARRIED WOMAN SHAVES HER HEAD

Men and women have the nasal septum and ear lobes pierced, and wear in the former elongated, pencil-shaped ornaments made of the white shell of the giant clam, and in the latter rolls of palm leaf, loops of cassowary quills, or selections from an assortment of other bone and shell jewelry. Women commonly have a series of V-shaped scars, like chevrons, on the leg, upper arm, or breast. Although the natives were questioned, we were unable to discover any significance for these marks.

Men are clean shaven except when in mourning or when old. Shaving is painful. It is done by looping a fiber about each hair and jerking it out. The barber's patron lies on his back and the barber sits on the sufferer's chest. Beards may be decorated with lumps of mud or other ornaments.

Until she marries, a girl wears her hair long. Matrons shave it off completely or bob it to about one inch in length. Sometimes small patches or tufts remain, in more or less geometric designs, and shell disks are tied to these, being fastened close to the head like "curl papers."

The Delta people are sago eaters, and the slow-growing palms may be private property, having been planted by the

Photograph by Dr. E. W. Brandes

THE SWIFT-RUNNING LALOKI RIVER (SEE, ALSO, PAGE 263)

Near here is one of the two operating rubber plantations in Papua. This site was selected as a propagating garden or intermediate depot for the Expedition's cane collection, which, to be kept alive, had to make the journey to America in relays.

owner's father, or they may be wild trees growing in the swamps remote from the village. When sago is required, the man will go to the tree selected, cut it down, and float the trunk to the village, the fabrication of the starch being turned over to the women.

Sago is supplemented by other products of the swamps and jungle, and a rude horticulture is carried on in clearings where the land is a little more elevated. The trees are cut down with trade axes and suffered to lie where they fall, the limbs being trimmed off and dragged away. Planting is done by thrusting a pointed stick of black palm into the ground and moving the free end back and forth to widen the hole. Joints of sugar cane, banana "bulbs" and cormels of taro are planted at random among fallen trees. Tobacco, manihot, coconuts, sweet potato, and breadfruit also grow here. Weeding is accomplished by tearing out the undesired growths by hand or with a trade knife, but the weeds sooner or later are responsible for abandonment of the garden. Apparently the native prefers to clear a new patch rather than face the drudgery of eternally fighting the weeds. In general only two successive plantings are made in a clearing, after which it is quickly reclaimed by the jungle.

A CANOE IS THE HUNTER'S OUIJA BOARD

Variety of food is provided by hunting and fishing. The native always carries his bow and arrows in his canoe or when walking in the woods, on the chance of

Photograph by Dr. E. W. Brandes

A HULA MAID SMILES INTO THE AUTHOR'S LENS

encountering a bush pig (see page 303) or cassowary (see page 326). The pig is a dangerous beast when wounded and the cassowary is no mean adversary; so hunting parties of a dozen or twenty men are preferred for protection and to increase the chance of returning with game.

A record of kills in hunting is often kept. In front of a house on the Kikori River I saw a device resembling a xylophone, made of tubes of bamboo of unequal diameter; this, it developed later, was the owner's wild-boar score.

Fishing is done by women as well as men. Girls may be seen wading about in the small streams, each provided with two conical traps held by the apical ends. These they thrust down at intervals, attempting to ensnare shrimp or fish. Such traps are shaped like canary or parrot cages and are made from strips of sago leaf. Nets, seines, and hand lines of various kinds are also used in the rivers and on the beach (see page 261).

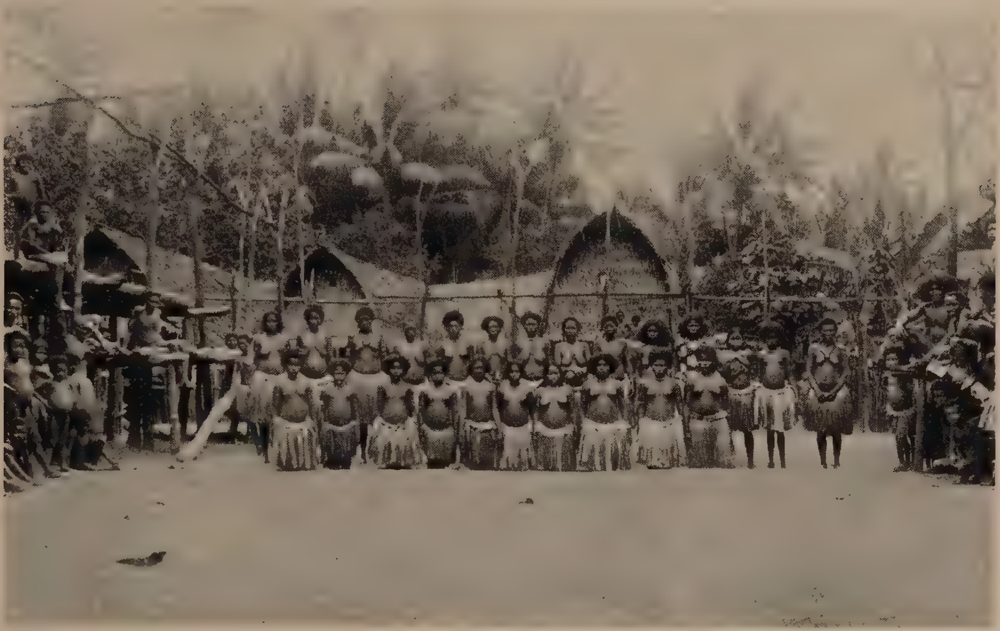
FISH ARE HUNTED WITH BOW AND ARROW

Shooting fish with bow and arrow is practiced here, as in most other parts of New Guinea. The fish arrow has four prongs of hardwood, not barbed but spread apart, at the point of attachment with the shaft, by means of a wooden plug bound between them. Spears for fish are much the same, but are larger and have more prongs. Fishing with these implements is done mostly at night with the aid of flares.

The large crabs of the Gulf of Papua are caught in great abundance and are an important trade commodity. With crabs the coast people of the Delta barter for tobacco with the inland tribes.

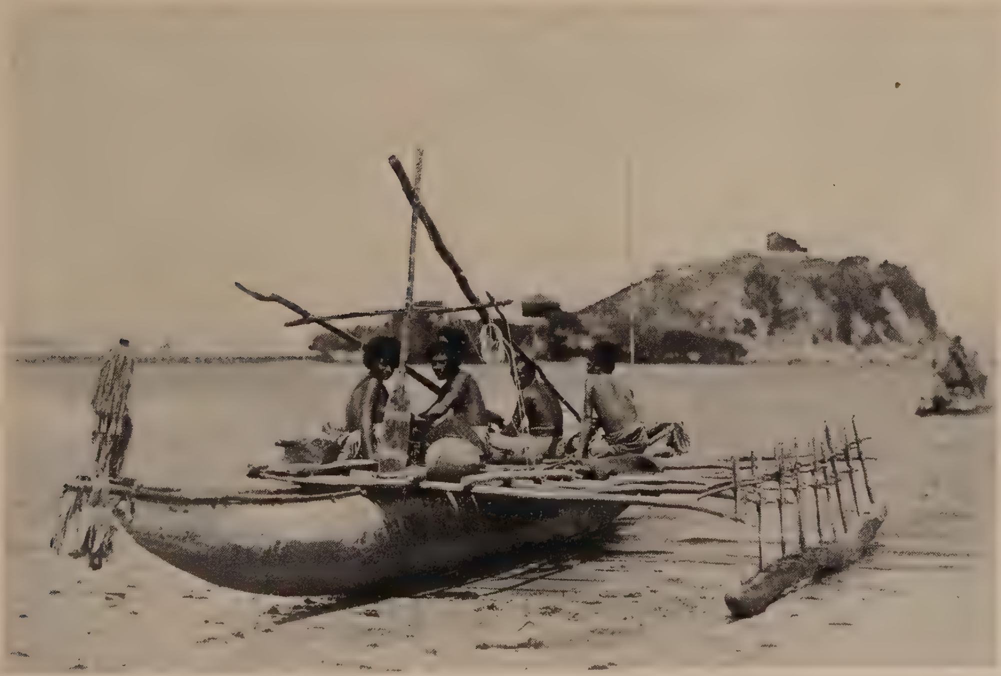
Just a short time ago there were recurrences of the violence and bloodshed that used to be common in the Delta Division. The natives of one of the Goaribari villages had been hostile toward natives on the Turama River, and a series of killings on both sides finally terminated in a massacre at a supposed love feast which was to mark the termination of hostilities. This was followed by a retaliatory raid, with taking of heads for trophies. The whole complicated matter was the subject of a Government inquiry at the time of our first visit to the Kikori.

At the Kikori police station a dugout paddled out to the seaplane to take us ashore.



Photograph by R. K. Peck

GIRLS ON HOOD POINT, NEAR RIGO, WEAR SKIRTS OF FRAYED SAGO LEAF



Photograph by Dr. E. W. Brandes

OUTRIGGERS PREVENT A CANOE FROM CAPSIZING IN ROUGH SEAS

On the islet in the background stands a village jail, tenanted largely by first-degree murderers. When the author visited the native jail at Kikori he found that of the 112 prisoners practically all were serving a few months each for first-degree murder (see, also, text, page 274).

Photograph by Dr. E. W. Brandes

STERN-VISAGED MATRONS FROM THE COAST EAST OF PORT MORESBY

Their hair is less kinky and their skin a bit lighter than that of the average Papuan, indicating an admixture of Polynesian blood. The necklace worn by the woman in front is made of clamshells.

We were hospitably received by the local manager of the Government rubber farm, all the officers being absent in connection with native troubles. We had thought to find a more pretentious settlement because of the large, bold-faced type used to indicate it on the map.

The station is on a small hill rising abruptly about 80 feet above the river. Short lengths of logs, secured by stakes, serve the purpose of treads and risers and enable one to climb to the top—a feat that would be difficult without them, on account of the rain that falls almost continually on the red, slippery clay at this season.

On top of the hill is a quadrangle of thatched buildings surrounding a level parade ground, bordered with crotons, hibiscus, and other brilliantly colored plants. The buildings consist of a headquarters house or office, barracks for the native police, a jail and infirmary for prisoners, storehouses, and three dwellings for the white personnel. We were told that the prisoners were all murderers, and I believe there were 112 of them incarcerated in the jail at the time of our visit.

MOTHER AND DAUGHTER ALONE BUT SAFE IN NATIVE VILLAGE

On the day after our arrival we were able to ascend the river to the native village of Ututi in a launch furnished through the courtesy of Mrs. Robinson of Ogamobu, a rubber plantation several miles upstream, the only commercial enterprise in this whole area. This charming and resolute woman and her young daughter were living in a plantation house, with only the protection of a faithful and devoted "boss boy," who presided over the plantation labor in the absence of Mr. Robinson, who was temporarily at Port Moresby, more than 200 miles away. That such an arrangement could be even thought of is a wonderful tribute to the success of the Government's system of establishing law and order, or at least instilling into the minds of these rude savages that the white man and his property are inviolable.

We were able to collect cane in the

Photograph by Alfred Gibson

IN A DANCE AT HANUABADA THE LEADERS WEAR GIANT HEADDRESSES OF BIRD-OF-PARADISE FEATHERS

Hanuabada, like Elevala, is a native village on the outskirts of Port Moresby.

gardens of several villages on the way, and finally arrived at Ututi, on the creek of that name, a tributary of the Kikori. This village has an unsavory reputation to live down, as it was here that Patrol Officer Kirby a number of years ago received one of the diabolical barbed arrows in his lungs and lived for two days transfixed, as the arrow was so fiendishly designed that it could neither be pushed through nor pulled out.

GIGANTIC CIGARETTE HOLDER IS USED AS COMMUNITY PIPE

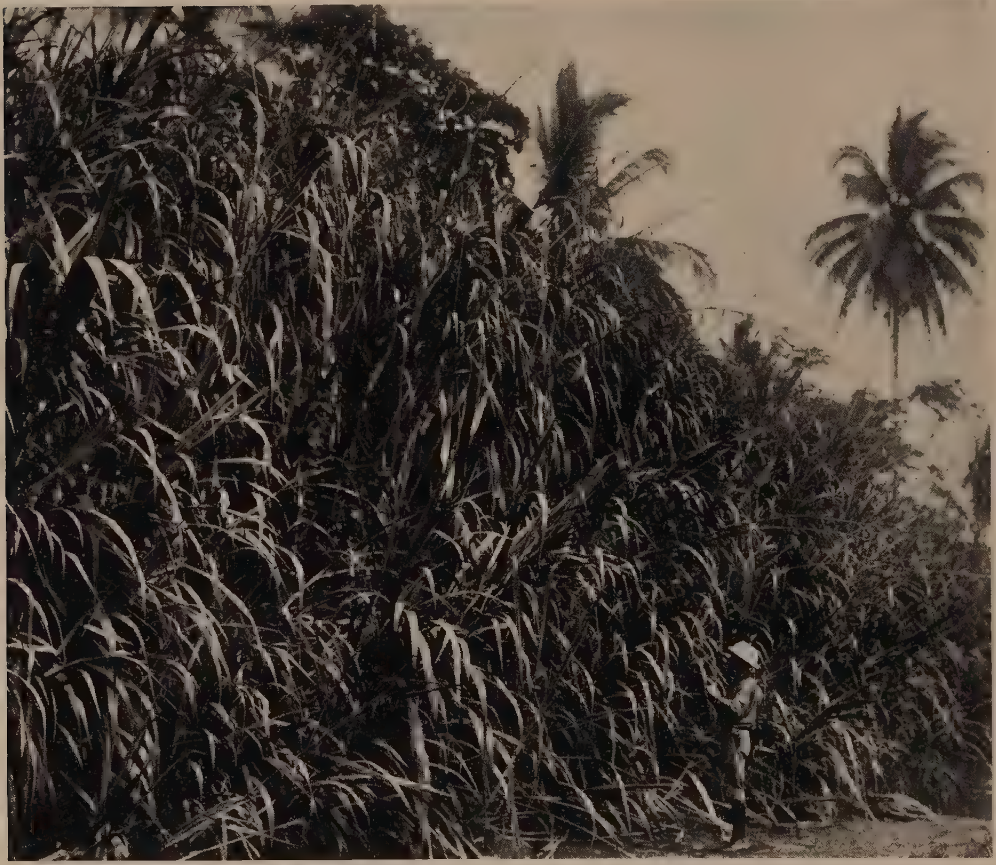
Ututi is elevated some ten feet above stream. It has a typical *dubu* (long house), which we were permitted to inspect after trading for sugar-cane specimens. A number of men, some clothed only in a shell pubic covering, lounged about, smoking the huge bamboo tobacco pipe or, more properly, cigarette holder.

This astonishing contrivance is about 2 or 3 feet long and 3 to 4 inches in diameter. It is open at one end, with a more slender detachable piece fitted at right angles into a small side-hole near the other end. The cigarette, rolled into a piece of fresh banana leaf, is inserted into the slender piece and the smoke drawn into the large tube by sucking on the open end of the latter. The slender tube is detached and the pipe is passed from hand to hand, each man taking a draft of smoke through the small side-hole, after which the slender tube with smoldering cigarette is replaced and the process repeated.

Some of these pipes are artistically carved and highly polished.

Pitiful wrecks of dogs growled and slunk into dark corners as we passed through the long central corridor of the clubhouse. On either side were stalls partitioned off, presumably for the exclusive use of individuals to sleep in or as a repository for their trophies, weapons, utensils, and personal gear.

Hearths of undetermined material were built into the floor near the walls. They were heaped with ashes, some smoking and filling the place with an impenetrable haze, as there was no smoke outlet or provision for ventilation other than the generally flimsy structure with wide cracks in floor and walls. The interior was most gloomy, there being no windows



Photograph by Dr. E. W. Brandes

SOME PAPUAN WILD SUGAR CANE GROWS TO A GREAT HEIGHT

This clump of wild cane, *Saccharum robustum*, with Pemberton of the American Expedition in the foreground, was found on the Laloki River, near Prison Garden, about 17 miles from Port Moresby. The species may prove of value for breeding purposes because of its strength and size.

and in fact no openings excepting the total lack of front and rear walls. After a long walk we arrived at the rear "veranda," where a number of pig and crocodile skulls were on display.

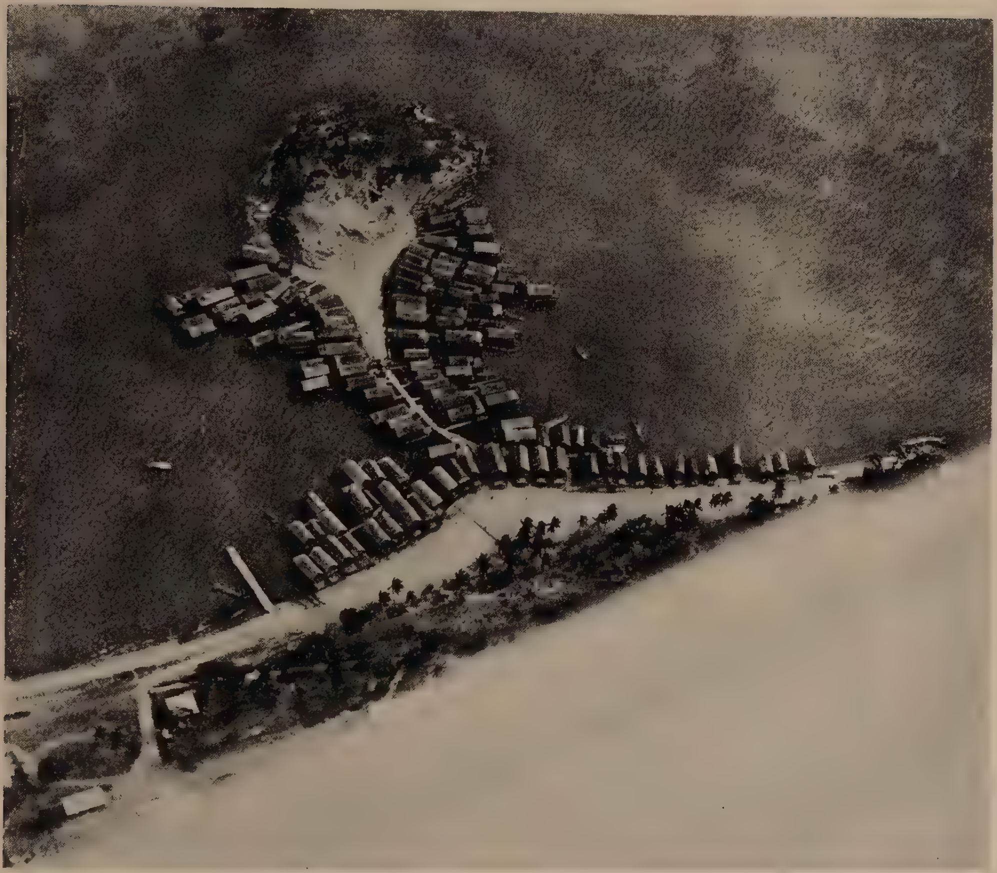
More dogs howled in the bush behind the long house. The native dog has no bark; his voice is a long-drawn, quavering wail. They usually wail in unison and it is a distressingly human sound.

TOBACCO LONG KNOWN IN NEW GUINEA

We saw a few miserable-looking women, but not a single child in the whole village. Beside one of the family dwellings was a small planting of tobacco with attenuated leaves. Now, we have been brought up to believe that tobacco was unknown, except in America, up to the time of Sir Walter Raleigh's famous introduction of the smoking habit to 16th-century English courtiers; but there is certainly evidence that it has been known and universally used in New Guinea for a long time.

Through our interpreter brought from Kikori Station, I learned that the seed of this particular tobacco patch was originally brought from the Samberigi, an isolated valley north of this place. This tobacco had ripe seeds, which we brought to Washington, and it will be interesting to learn if it is a species unknown to America.

Trade of a desultory nature is carried on by these people with the inhabitants of



Photograph by Dr. E. W. Brandes

COAST DWELLERS BUILT THEIR HOMES OVER THE WATER AS A SAFEGUARD AGAINST RAIDS OF HEAD-HUNTERS FROM THE HILLS

A crude bridge connects the mainland with the rocky island of Elevala, one of the three native settlements adjacent to Port Moresby. In the left foreground is a small pier, which looks from the air like a white log jutting out from the shore.

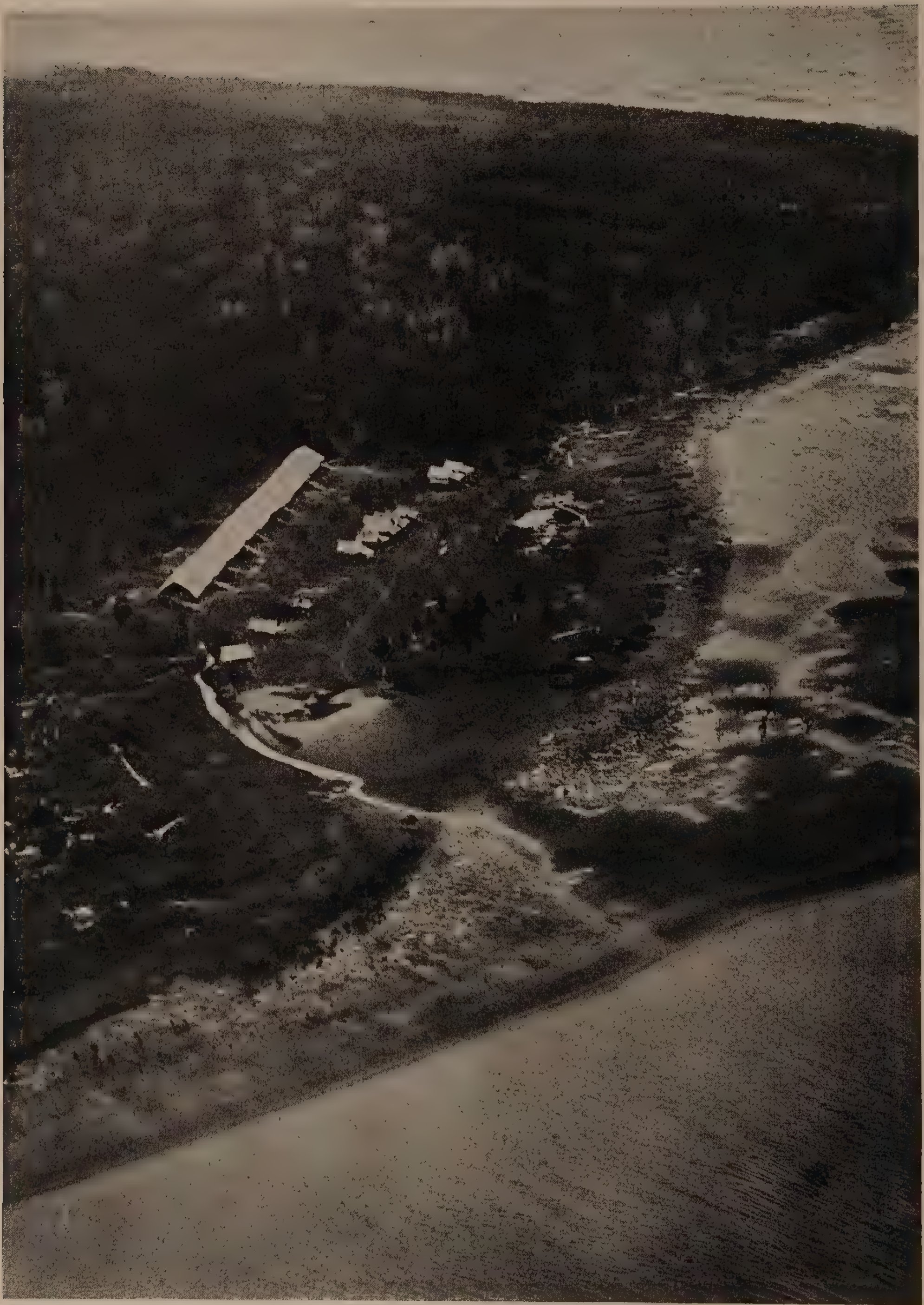
the Samberigi. The only known outlet for the latter is through a watercourse in a deep ravine, impassable except during the dry season. They come to a point intermediate between their valley and the Kikori River villages and trade in this "no man's land" during a fixed period of truce, when the two peoples mutually agree to refrain from acts of violence. Before or after this truce, it is fatal to cross the dead line!

During our stay there was a fitful arrival and departure of canoes, usually with only one individual in each, invariably carrying bow and arrows and baskets made of the leaf sheath of a palm ingeniously folded and pinned, so that it made a convenient receptacle for lumps of sago, shrimps, or other food. These people all seemed rather sullen and went silently about their business. They did not even cast a glance in our direction. Some were literally caked with mud and filth.

We returned to Kikori, depressed by the sight of Nature's masterpiece, man, as represented by such a primitive people.

Next morning Dr. Jeswiet and Pemberton started on a collecting trip by launch to Aird Hill, where a mission station is located, and Peck and I took off for Everill Junction, the confluence of the Fly and Strickland rivers (see inset map, page 255).

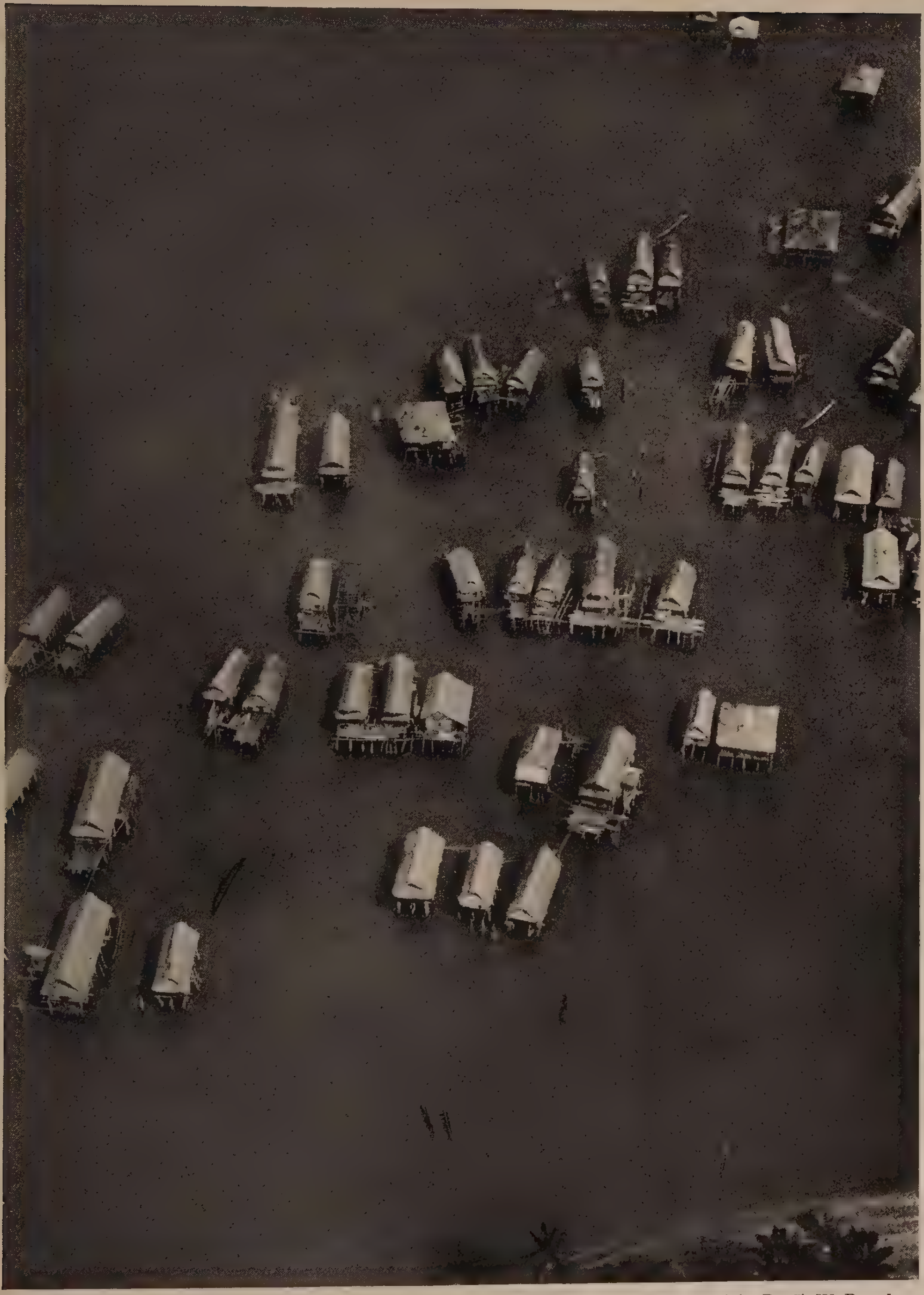
It may be interesting to draw a comparison between our two modes of travel.



Photograph by Dr. E. W. Brandes

A DUBU, OR MEN'S COUNCIL HOUSE, ON THE FLY RIVER

Such enormous structures are used primarily by single men, but husbands also retreat to them from time to time. This dubu is about 350 feet long and 40 feet high. Some dubus measure 600 feet in length. No woman may enter.



Photograph by Dr. E. W. Brandes

FROM THE AIR, NEW GUINEA'S COASTAL VILLAGES RESEMBLE GIANT WATER STRIDERS

The inhabitants of this important village of Hula, near Port Moresby, are among the most intelligent and aggressive natives of Papua. Some Polynesian blood is in evidence here, whereas in most of coastal New Guinea Melanesian stock is predominant.

Photograph by Dr. E. W. Brandes

AN AIR VIEW OF A PALM-FRINGED BEACH BETWEEN YULE ISLAND AND THE KIKORI RIVER

Among the coconut trees a village is half hidden, and native fishermen, frightened by the passing plane, are rushing homeward from the surf.

The launch had a 20-mile round trip to negotiate that day, but, owing to strong adverse tides, it was so delayed that darkness was approaching when the party was ready to start back to Kikori. It did not return at all that night. The seaplane returned, after a 700-mile trip to the deep interior, interrupted by three landings and inspection of a proposed camp site en route; then went over the route to Aird Hill, searching for the launch; discovered it, and returned to Kikori, all between 9:39 a. m. and 5:59 p. m.

THE "VANAPA" STARTS WITH CAMP SUPPLIES UP THE FLY RIVER

It was on June 27 that the *Vanapa* had left Port Moresby, with our heavy gear, supplies, and most of the personnel, bound for some point near the junction of the Fly and Strickland rivers. Counting slight delays, I had calculated that the journey would require three weeks.

We wished now to make a reconnaissance ahead of the *Vanapa*—that is, to save time by inspection of the banks for a suitable camp site, and then to come back, find the vessel, and leave instructions with those aboard. So, with full tanks and stores as a precaution against forced landings in this wild country, we took off on July 12 from Kikori.

We flew first to the Turama River, to drop mail at the temporary police camp under construction there. We discovered this camp and flew over it. It is a wild spot and it gave us a pretty good idea of the conditions under which the officers of the Papuan service carry on their hard, hazardous work. Fortunately, the service is not lacking in men who possess the qualities of perseverance, courage, and diplomacy in dealing with the natives under most disheartening conditions.

We proceeded southwest and passed over the mouth of the Bamu. This stream is known for its astonishing tidal bore, so dangerous to small craft. We did not see the bore during our trips across the river, but it was described as a white-crested wall of water 9 feet high, extending from bank to bank.

Photograph by Dr. E. W. Brandes

STALWART SAVAGES OF UTUTI VILLAGE, ON THE KIKORI RIVER

Some of these men were implicated in Patrol Officer Kirby's murder (see text, page 275).

Continuing beyond the Bamu, we flew over a number of villages built on the tidal flats bordering the streams that form a network of inland waterways here. For the most part, these settlements consisted of the typical long house, of immense size and length, and a few huts secreted among the trees back of it.

Dozens of long dugout canoes without outriggers could be seen drawn up on the muddy flats, and a few similar ones scurrying for the shore, propelled by naked paddlers standing erect. The villagers, as active as ants whose nest is kicked by a careless boot, were plainly thrown into panic by the sudden appearance of our plane.

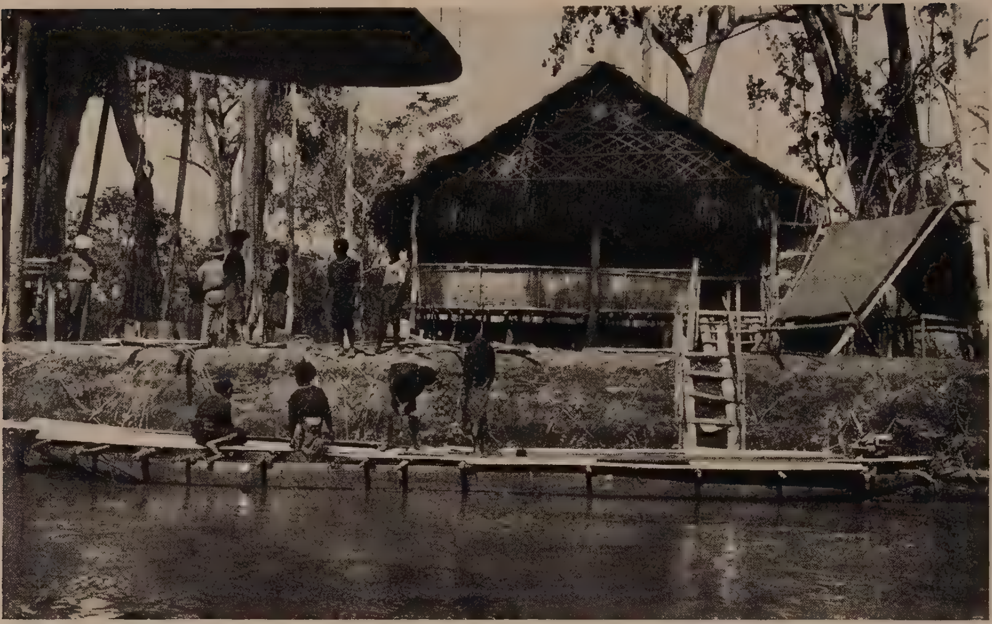
OVER THE ISLAND-STUDDED ESTUARY OF THE FLY RIVER

By 10:45 we had reached the left bank of the Fly River and saw for the first time the vast, island-studded estuary of that famous stream. Although more than 5,000 feet above the sea, we were out of sight of the right bank and could realize the dilemma of those early navigators, who were so confused by its numerous channels that they did not know if they were viewing one or a number of rivers.

Joseph B. Jukes, chronicler of the voyage of H. M. S. *Fly* in 1842, records that when ten miles offshore the water was muddy and only slightly brackish, so Captain Blackwood decided it must be the mouth of a large river. On this evidence Blackwood is credited with the discovery of this mighty stream.

A missionary, the Rev. S. MacFarlane, was the first to offer proof that it is indeed a river. In 1876, with Luigi Maria d'Albertis, the Italian naturalist, he ascended it in a small steamer as far as Ellangowan Island. To D'Albertis, however, belongs the credit for the first real exploration of the Fly River, when later, in 1876 and in 1877, he penetrated more than 500 miles into the interior in a steam launch. His maps, published in 1880, are a monument to the industry and endurance of this naturalist of the old school.

Aside from the exploration of the Strickland by Captain Everill and the discovery of Lake Murray by Massey Baker's party in 1913, the only recent milestone of importance in exploration of the Fly water-



Photograph by Dr. E. W. Brandes

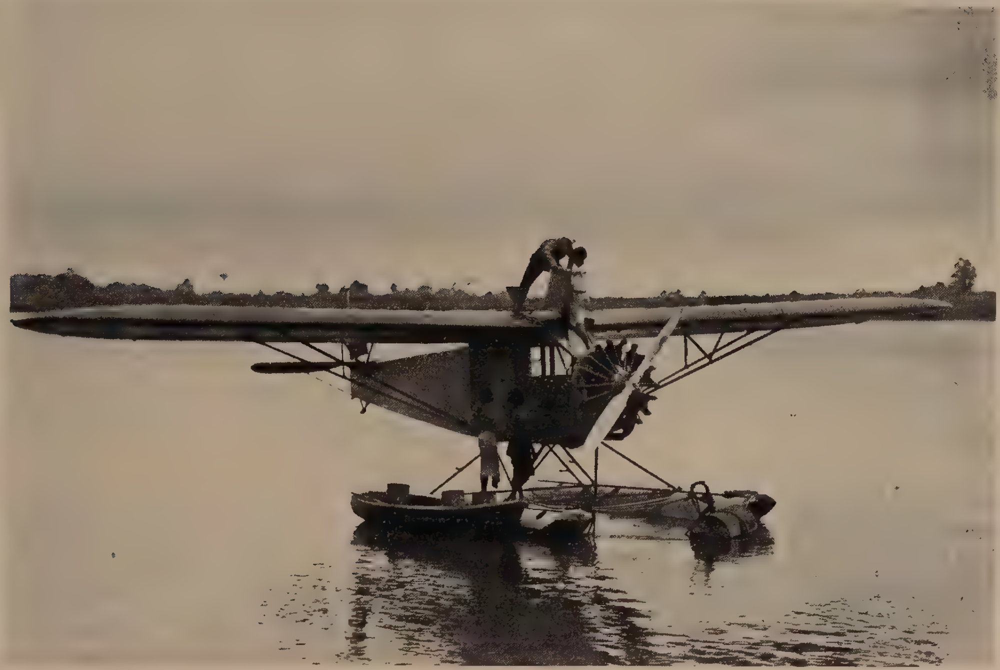
BASE CAMP ON THE FLY AND STRICKLAND RIVERS

In the foreground is a twin-cylinder, outboard, motor-powered, double canoe, which could travel at the rate of six or seven miles an hour when loaded with several tons of gear and provisions. A trade ax worth 55 cents bought two such canoes, representing months of labor. Note the wing of the airplane at the upper left.

Photograph by Dr. J. Jeswiet

THE EXPEDITION DINES AL FRESCO

Left to right, as seated: Peck, Champion, Brandes, Pemberton, and Bannon. One of the chief hardships of the Expedition was occasioned by the pest of winged insects.



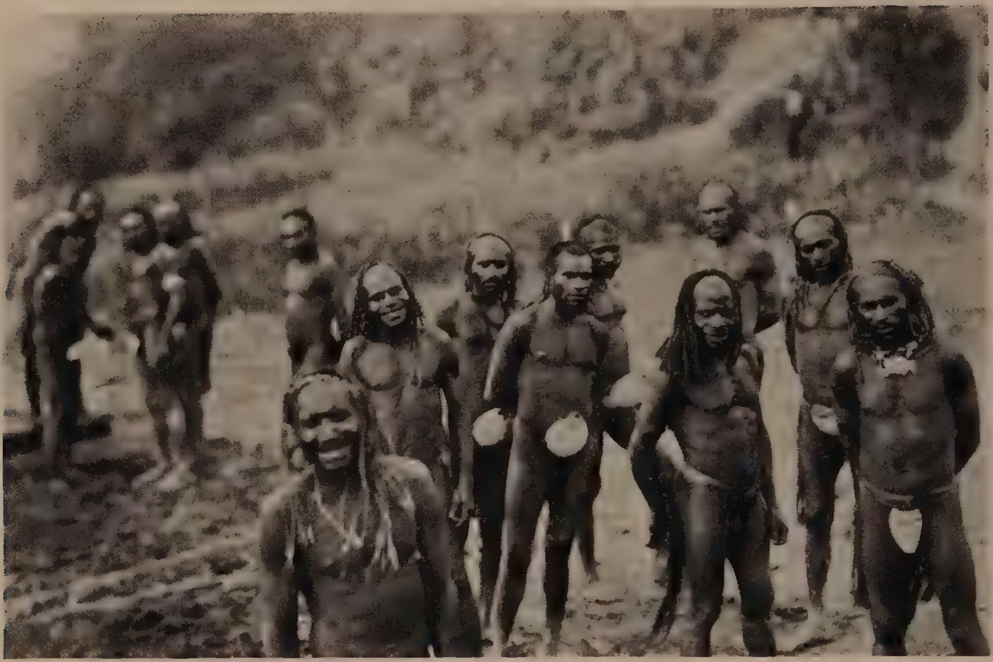
PILOT PECK "GASSING UP"

Whether gas and oil will actually be waiting at the spot where it is hoped to find them is the constant nightmare of flyers in wild countries. The seaplane used by the Expedition could carry sufficient fuel to make a round-trip flight of 800 miles with safety. It was designed with folding wings and was completely assembled when taken from the steamer at Samarai.

Photographs by Dr. E. W. Brandes

HAULING A CROCODILE UP POLE STEPS TO BASE CAMP

In one day, about this camp, the men shot seven large crocodiles. These reptiles are very aggressive in Papua, and hence are much respected by natives.



Photograph by Dr. E. W. Brandes

CURIOUS, YET TIMID, THEY STUDY THE RECENT ARRIVALS FROM THE SKY

After two hours of coaxing, these natives of the upper Strickland River region came out of the jungle, whence they had fled at the sight of the seaplane hovering over their village.

shed was erected in 1928 by Messrs. Karius and Champion, of the Papuan Government service. They followed the Fly to its headwaters, then crossed the towering Victor Emanuel Range, and descended via the Sepik to the Pacific Ocean. In importance and general interest this extraordinary feat, which occupied more than half a year, ranks with the best modern conquests of unknown territory.

WE "WASH" TWO LARGE ISLANDS OFF EXISTING MAPS

We followed the left bank of the great river, flying at 6,000 feet almost due west, passing over 15 or 20 native settlements. In them stood dubu houses of extraordinary size, some at least 500 feet long.

By 11:15 we had left the last of the estuary islands far behind. But the river was still several miles wide, and both banks were thickly wooded for one-half to five miles back. Beyond this ribbon of jungle were poor scrub and grass prairie. From our elevated position we could see in the clear air for a great distance, but the country was perfectly flat as far as the eye could reach.

We began now to see the possibility of checking up on the geographical features of the country, as represented on the recent charts in our possession. Without going out of our way, it seemed an easy matter to correct the slight inaccuracies of the charts and thus perform a service that might be welcomed.

The great Fly River, in common with similar streams, is gradually but continually changing its course. Oxbows are being pinched off, leaving semicircular lagoons. Islands are building up with silt; others are wearing away or becoming one with the mainland, and from the vantage point of our position many of these processes were unfolded with startling clearness.

As a beginning, we washed off the map two large islands which simply no longer exist or never had!

It occurred to me, furthermore, that we were about to see spread before us some 40,000 square miles of territory in western Papua and Dutch New Guinea, only a small proportion of which had been seen previously by civilized men.

From an altitude of nearly three miles,

Photograph by Dr. J. Jeswiet

ALONG THE MUDDY BANKS OF STRICKLAND RIVER WILD SUGAR CANE GROWS LUXURIANTLY

In such favored spots as this the Expedition found many of the varieties it desired. Here the species *Saccharum robustum* is shown in bloom.

attained many times, we later beheld on clear days an area equivalent to one-third of the total covered by the Territory of Papua.

THE FIRST AIRPLANE TO REACH THE INTERIOR OF PAPUA

No airplane had previously been in the interior of the Territories of Papua and New Guinea, although flying boats had skirted the coast and a land plane had on one occasion made the perilous trip over the mountains of the eastern peninsula. I therefore devoted a part of my time during our numerous flights to photographing and sketch-mapping lakes and other features not on existing charts. These features are shown in their approximate locations on the map on page 255. They are roughly tied in with known and described points, and the most that can be said for our cartographic contributions is that they demonstrated to the authorities in Papua the practicability of surveys with seaplanes.

For the next 100 miles there was no sign of habitation on the Fly, although we occasionally saw smoke 12 to 15 miles back from the river, sure sign of the presence of man in this humid country, in which spontaneous fires never occur.

At noon the *Vanapa* was sighted 8 or 10 miles ahead, still some 60 miles from her destination. We landed beside her and taxied into the bank. Two wild varieties of sugar cane rewarded my efforts here while waiting for a small boat from the ketch.

YOUNG LADIES FROM AMERICA SUDDENLY APPEAR

Once aboard the *Vanapa,* we were relieved to find everyone well and were somewhat astonished to discover among the passengers two young ladies in shorts, who spoke with an undeniable American accent (see, also, page 267).

They proved to be from Cleveland, an artist and her companion on a sketching trip around the world. Far indeed they were from the tourist trail. They had wheedled our captain into taking them

Photograph by Dr. J. Jeswiet

A CIVILIZED NATIVE SOLDIER DETAILED TO GUARD THE EXPEDITION'S BASE CAMP

In his hands he is holding panicles of a tall grass, *Imperata arundinacea,* resembling sugar cane.

along when he had stopped at Daru. It is certain that they will never be farther from home than on the Fly River. The captain had pitched a wall tent on the flat roof of the aft cabin to accommodate the strangers, and, surrounded by all the comforts of home, they surveyed the jungles primeval.

We had tea and biscuits in good Australian fashion. Then we took off, with Mr. Ivan Champion, to fly to a place we had now agreed upon as a rendezvous—a camp previously used by the Government patrol in pursuit of raiders who had massacred the inhabitants of Weridai, a village on the lower Fly. It was our good fortune to find this site habitable. We flew up the Strickland a way, got a distant view of Lake Murray, then returned to the *Vanapa.*

All plans for occupation of the base camp seemed to be progressing satisfactorily, so we returned to Kikori. Next day, Friday, the 13th of July, with Jeswiet and Pemberton aboard, we embarked on our 13th flight in New Guinea. The long trip back to Port Moresby in a half gale was uneventful; but once, in experimenting on the time capacity of the left-wing tank, it went dry. We nosed down from an elevation of 2,500 feet to about 100 feet above the angry sea, far out in the Gulf of Papua, before the motor took hold again! Yet, even after this experience with all the forces of the calendar against us, we still felt that the seaplane was our safest vehicle for exploring New Guinea.

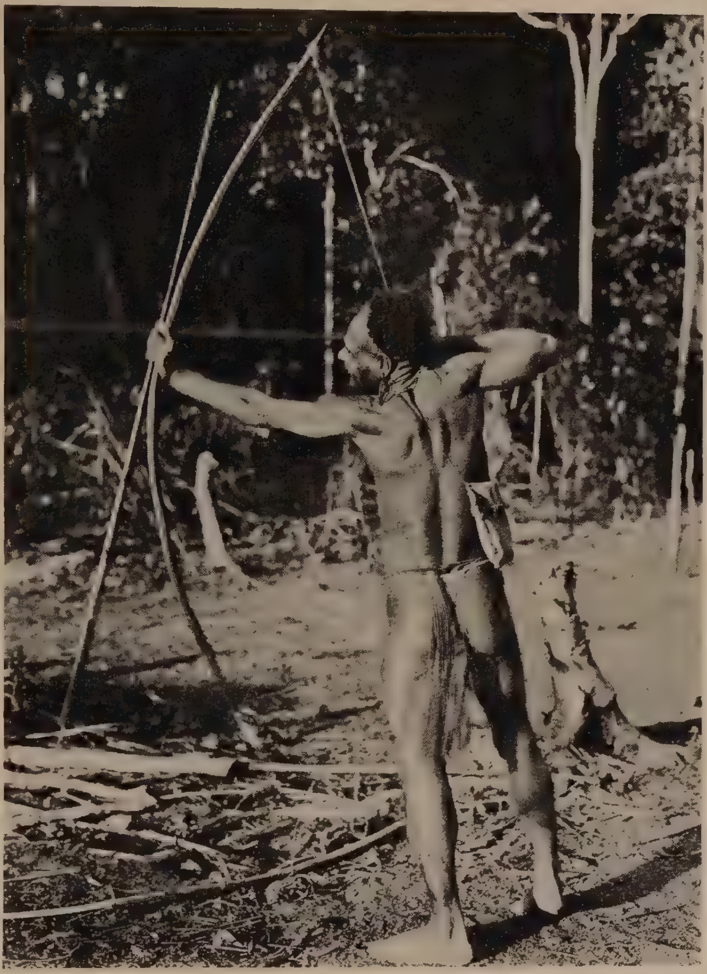
After preparing our sugar cane for shipment, and storing it in the Port Moresby ice plant pending arrival of an oversea steamer, the entire scientific party took off once more for the base camp, to start in earnest our search for sugar cane in the untamed regions where it and almost everything else were reputed to be very wild.

NATIVES VISIT BASE CAMP ON ONLY TWO OCCASIONS

We got to our Fly River camp on July 21 and found everything shipshape. Daily routine was established. A strict military régime was maintained, with sentries pacing their beats at night. But nothing happened to indicate hostile intentions on the part of the natives. In fact, we were visited by them only twice. Once a group came in a canoe, with an 18-foot python twitching its tail despite fearful wounds. They doubtless brought it as a propitiatory offering to grace our table, for they enjoy snake meat.

The second visit was opportune for us. We had just shot a crocodile in front of camp, and no one was yet familiar enough with the necessary handholds to maneuver a supposedly dead reptile of this size up the high, slippery bank. But these wild gentlemen seized it with apparent unconcern, and tugged and hauled its huge bulk to the place designated. The tenacious hold on life of these creatures is well known, so Peck was suspicious enough to put two more bullets into its head. Despite this, it crawled about during the night, but without injuring any one.

The rains had now ceased and the camp had become almost dry, except for water in the deep, gaping cracks in the sun-dried earth. This furnished a breeding place for mosquitoes. Among them Pemberton found three species of Anopheles, the malarial mosquito. A large gray Culex was prevalent in such numbers that we were unable to sit down to lunch, but paraded in a circle about the table, reaching for a plate of beans in the manner of those patronizing well-conducted buffet luncheons. The order was "under the nets at sundown" or take the consequences.



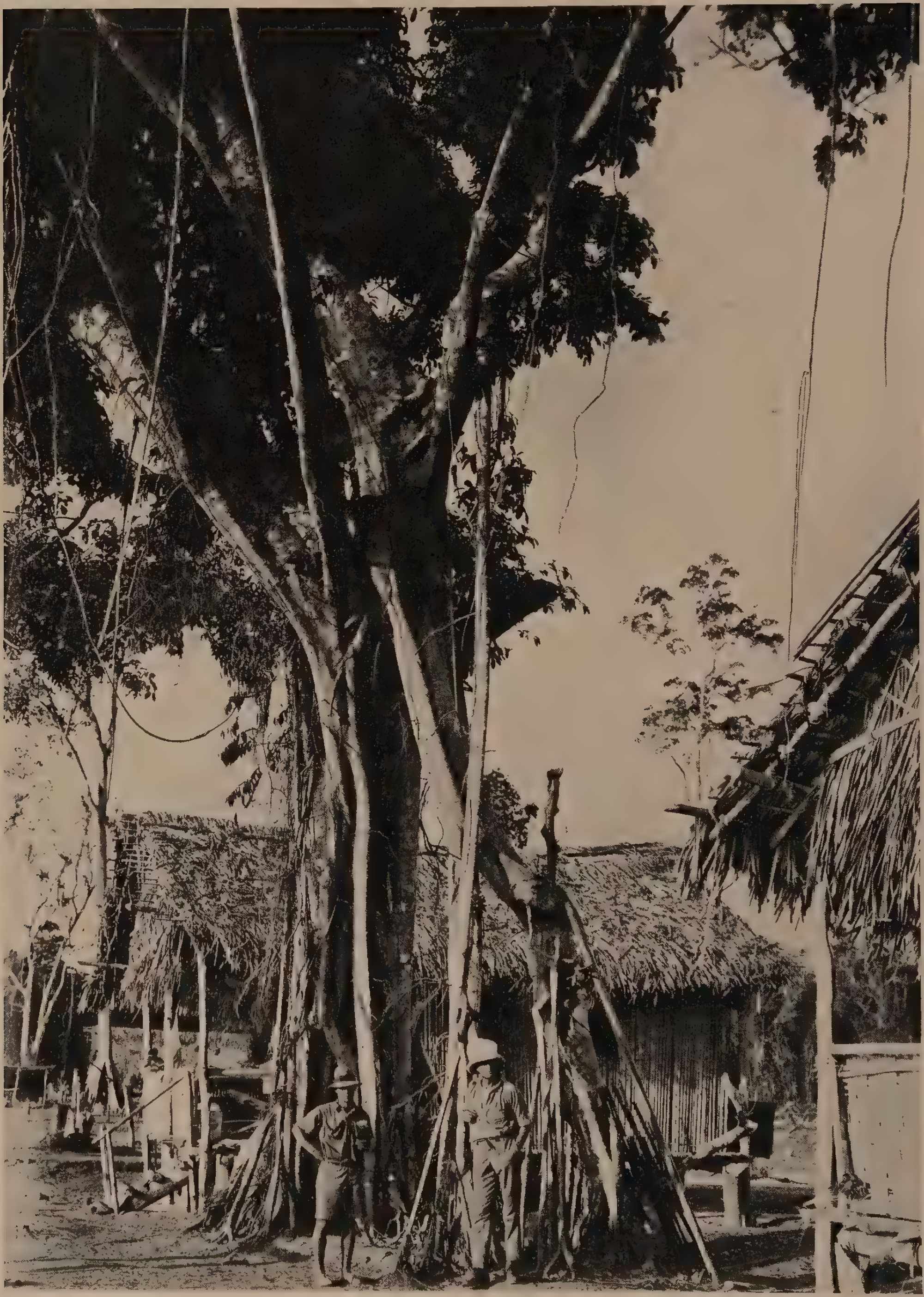
Photograph by Dr. J. Jeswiet

FOR RAPID FIRE, HE HOLDS RESERVE ARROWS IN HIS LEFT HAND

Made without feathers, these arrows take a spiral motion in flight (see, also, illustration, page 295). This warrior is from a village on the Strickland River.

JUNGLE FOLK FLEE AT SIGHT OF PLANE

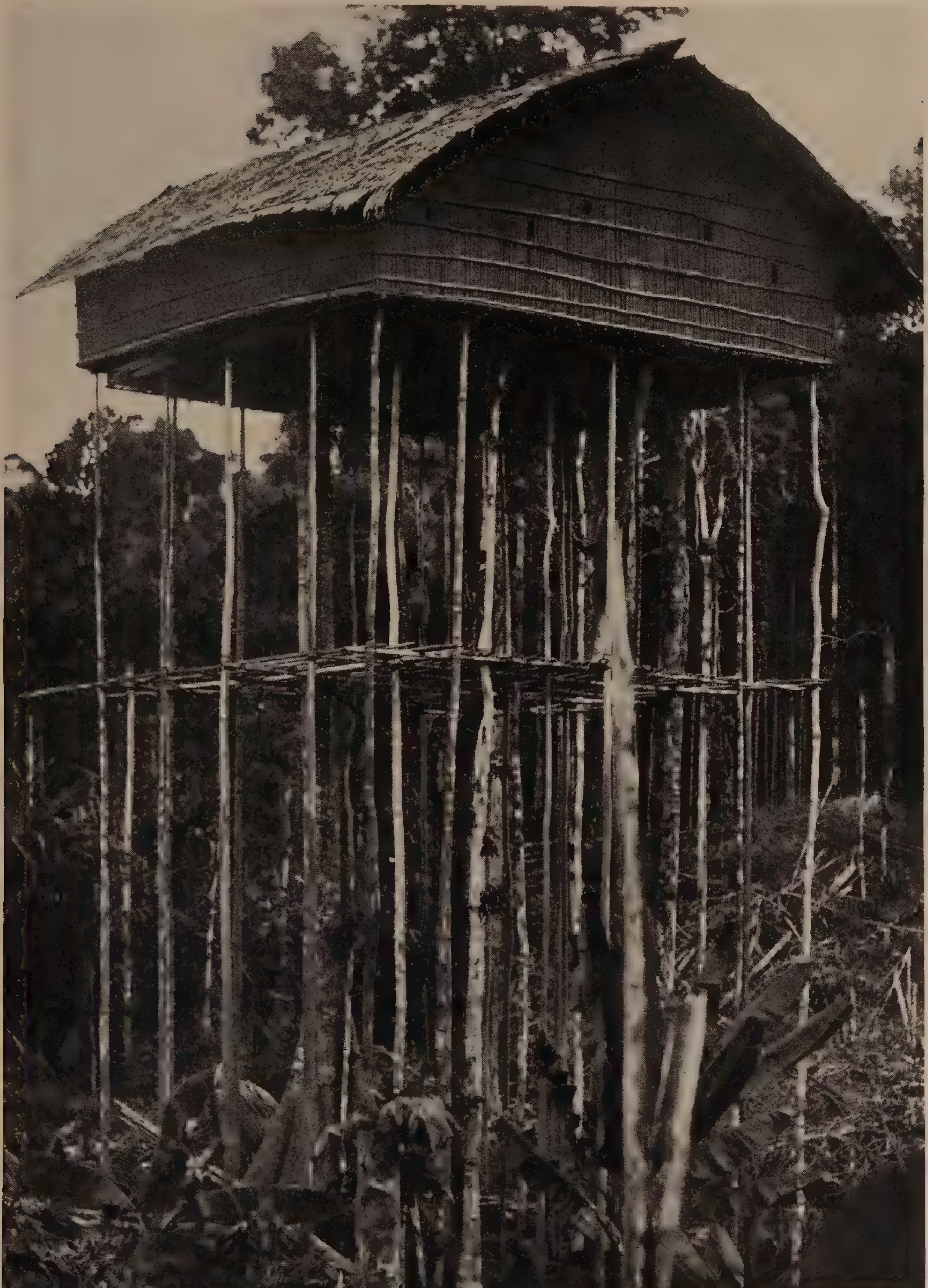
On July 22 we took off for a flight up the Strickland to seek Champion, who had set out four or five days previously with a police detail in a double canoe propelled with one of our twin-cylinder outboard motors. We were concerned for his safety, so we scanned the river en route to Lake Murray, but without locating his party. Later we learned that they were in a narrow channel between some islands when we passed.



Photograph by Dr. J. Jeswiet

A FICUS TREE AT THE EXPEDITION'S BASE CAMP

This New Guinea cousin of the banyan and peepul trees, all members of the fig family, is usually the main pillar supporting the houses of pygmy tree-dwellers (see, also, pages 289 and 309). Note the size of the aërial roots, which are sometimes utilized by the pygmies as supplementary supports for their houses.



Photograph by Dr. E. W. Brandes

LIKE HUGE BIRDHOUSES ON POLES ARE THESE PYGMY DWELLINGS

Usually the central support of such a structure is the trunk of a ficus tree (see opposite page), the top of which has been hacked off with stone axes (see page 298). On the halfway platform two small boys are standing. The dwellers are most adept in rapidly ascending or descending by means of a notched pole when danger threatens.

Photograph by R. K. Peck

THE AUTHOR AND A DIMINUTIVE BLACK FROM KATINGOR

The relative heights of the American and the Papuan are not clearly indicated in this photograph; the former was standing on much lower ground than the native, as indicated by the relative position of the knees.

We saw a village with a large community house, on a lake just southeast of Lake Murray, and descended low to inspect it. Its people fled for their lives into the bush.

Continuing, we circled Lake Murray, exploring every bay and estuary for signs of Champion, but without success.

This lake is 40 miles long from north to south, with dozens of narrow estuaries terminating in small streams extending, like the tentacles of an octopus, in all directions. It is a spot of surpassing beauty, viewed from the air, and is the home of a lotus with magnificent pink blooms, about 10 to 14 inches in diameter, and other gorgeous water plants. Endless flocks of geese, ducks, and herons rose from the water beneath us as we passed.

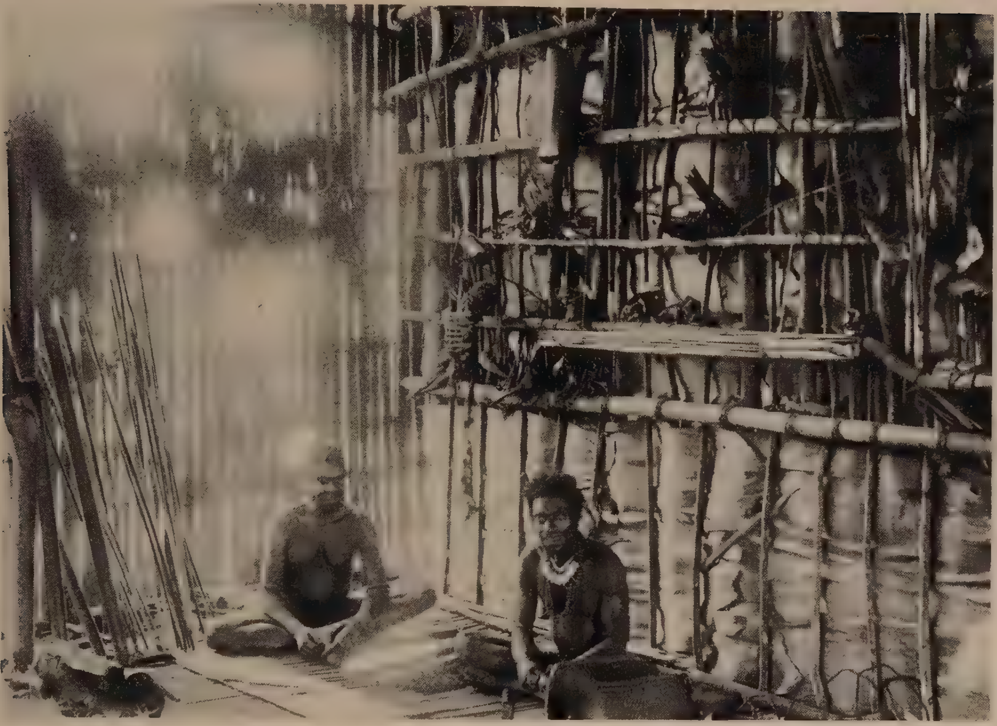
Peck tried to shoot some ducks and we had an exciting few minutes maneuvering to get "on the tail" of the flock.

We saw six villages during our long trip around the lake and had an amusing experience with some natives in two long canoes near an island. Wishing to inspect them at close range, we volplaned down toward them from a great height. But the view we got was only of their feet, as the whole crew jumped overboard!

It goes without saying that we were considered supernatural. All natives of this island with whom white people have been able to exchange ideas of an abstract nature have disclosed strong beliefs in spirits, malignant as well as beneficent. Most of them conceive of ghosts of departed friends and enemies, who must be placated in various ways to avert dire consequences.

A VISIT TO A DESERTED DUBU

Of course, the civilized coastal native becomes reconciled to the airplane very quickly. They now accept the powers of the white man with indifference. After seeing boats that go without paddles or sails, paper that talks, phonographs, etc., they are resigned to the conquest of the air,



Photograph by R. K. Peck

THE INTERIOR OF A PYGMY TREE-HOUSE BUILT 60 FEET ABOVE THE GROUND

To get this picture, Peck, hampered by his camera, had to do some hard climbing. Against the wall at the left are digging sticks, bows, and arrows. Between the two men is a sunken hearth. At the right is a "whatnot" containing arrows, headdresses, and other personal belongings.

and with a shrug put it down as fresh evidence that "white-man fashion" is different from "New Guinea-boy fashion."

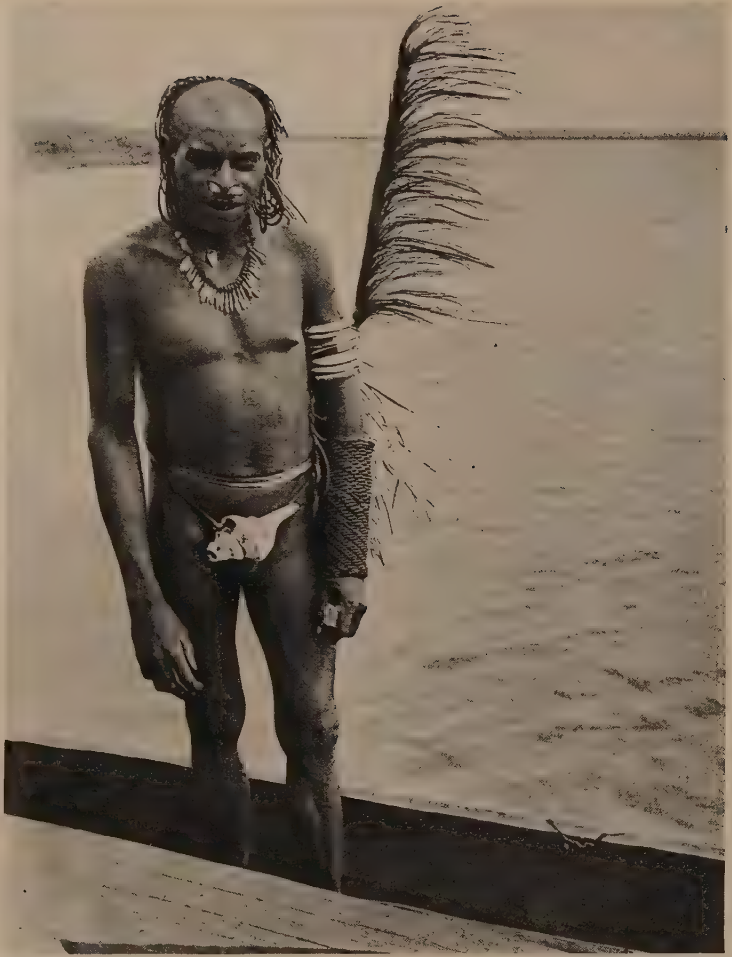
We flew back to the village first seen and descended on the smooth water in front of it. A close-up view disclosed the typical big dubu, or long house, with yawning entrance to a dark interior. Grinning human skulls were arranged on racks just within, presumably a defiant challenge to strangers and a warning of what they might expect if they sought to enter.

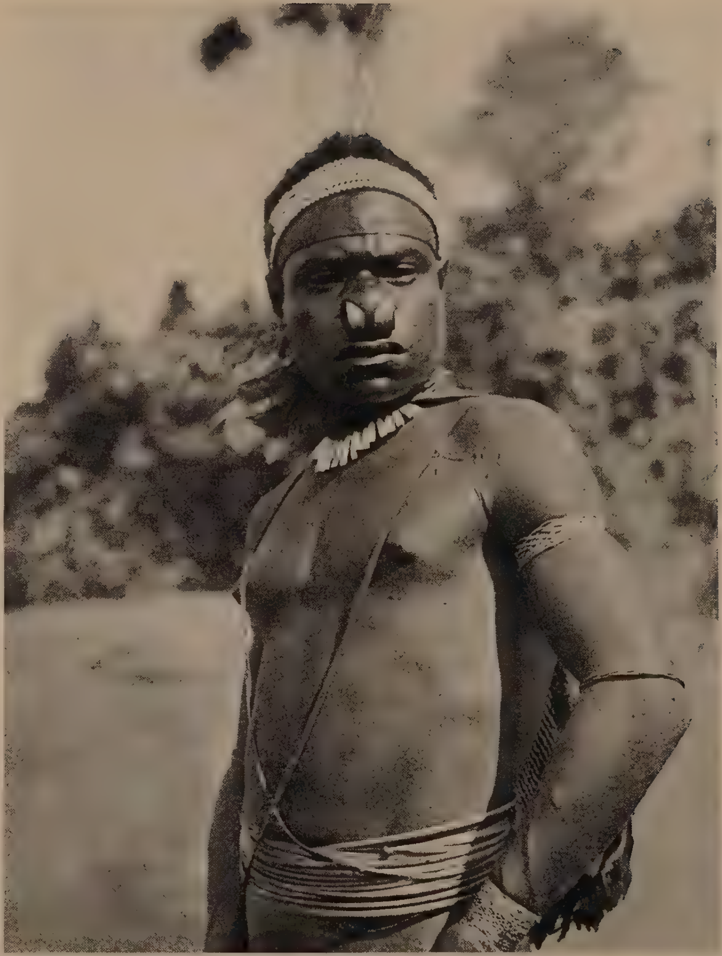
This dubu faced the lake and stood in a thick grove of coconuts and other trees. Several canoes were on the shore tethered with rattan. A narrow path led through a heavy growth of tall Eulalia grass, up the steep bank and across a level space to the entrance. No signs remained of the fleeing natives we had observed when we passed over, but we had an uneasy feeling that we were being observed. Not knowing the character of the reception we might receive, we faced the seaplane into the lake and paddled shoreward tail first.

Upon grounding in the mud, we leaped into the water and walked across the shingle to the high bank in full view of the dubu, shouting in a loud but (as we fondly hoped) friendly tone all the while. There was no answer. Was the silence ominous or did it merely mean that the fierce savages (as they had been described to us) were now far away?

We carried no rifles in our hands. To the primitive man a rifle is a club, and he is thoroughly cognizant of the uses of a club. A pistol in its holster is to him purely ornamental. He has no conception of the sudden death lurking in such a small, innocent-looking package. The principal defense upon which we now relied was a wide smile, and as we advanced we did our best to register pleasure.

Still nothing happened. Did that slight





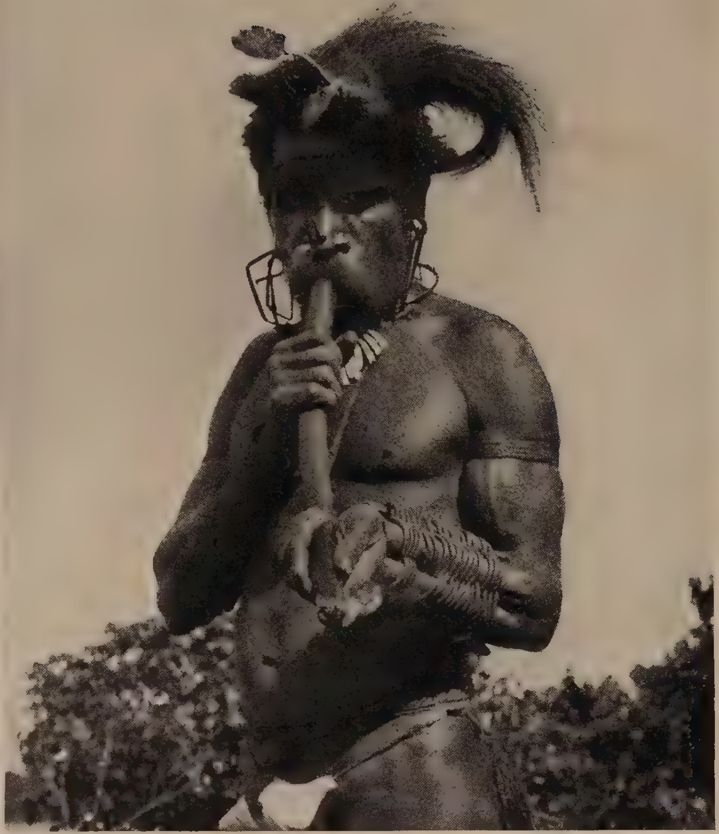
Photographs by R. K. Peck

HIS HOME IS AN ISLAND IN LAKE MURRAY (SEE ILLUSTRATION, PAGE 308)

To protect his wrist against his bow string, he wears a woven rattan guard (see, also, page 293) on the left, or bow, arm. Into this he has stuck a plume of cassowary tail feathers. Around the upper arm he

A KATINGOR PYGMY WEARS HIS FIRE-MAKING APPARATUS AS A GIRDLE (SEE TEXT, PAGE 314)

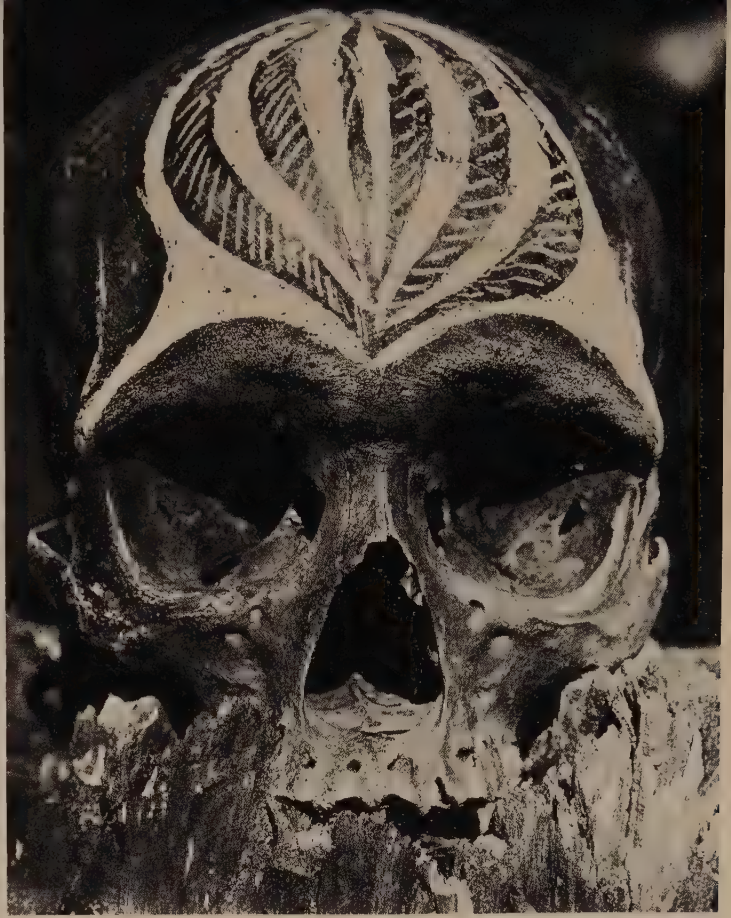
In his nose is the customary bamboo plug. His coronet is made of the seeds of Job's-tears and his necklace is composed of pigs' teeth. Slung across his back is a palm-leaf bag, in which he carries a supply of



Photograph by R. K. Peck

A PYGMY TAKES A SMOKE

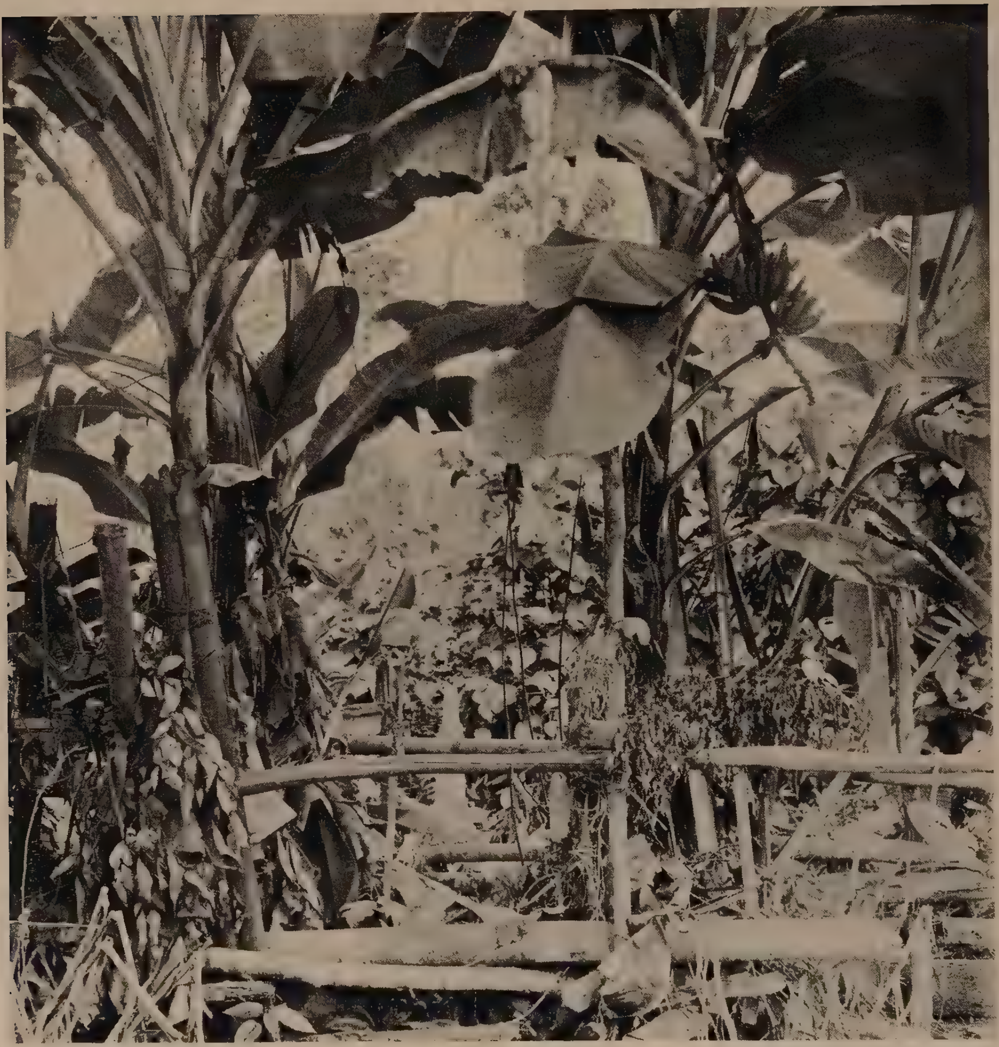
He wraps his tobacco in a bit of banana leaf and inserts it in this mammoth cigarette holder. He wears the rattan wrist protector (see, also, opposite page). Through the septum of the nose is thrust a bamboo plug, and through the skin of one nostril protrude the claws of a flying fox. From his ears hang quills of the cassowary and the plumage of that giant bird forms his headdress. His necklace is made of pigs' teeth.



Photograph by Dr. J. Jeswiet

A PAINTED TROPHY OF A HEAD HUNT

Skulls are much used in the arts and rites of New Guinea tribes. Not only the bones of enemies but also those of deceased relatives are employed for many purposes. Among some tribes a widow wears her departed husband's thigh bones as a collar around the neck or as "panniers" about the waist. This skull is mounted on a post in a pathway near the dubu at Miwa (see page 294).



Photograph by Dr. J. Jeswiet

SKULLS ON POLES GRIN FROM JUNGLE NOOKS

In this cannibal country such grim trophies confront one suddenly from the least-expected places. This specimen (see, also, page 293) is mounted on a post back of a crude stile leading to a village garden.

movement of grass on our right mean a lurking warrior? It seemed wise to wait a bit.

A PAINTED SAVAGE LEAPS INTO THE OPEN

We continued to shout and at intervals to advance step by step. And we got slight comfort in the thought that we were covered by those remaining in the plane and would be quickly revenged if speared.

The suspense was wearing. Could that movement in the grass be merely the wind, after all? No, sir! Positively, it was not! For now a painted individual suddenly leaped up, not 15 paces away, and emitted a startling string of gutturals, accompanied by violent gestures.

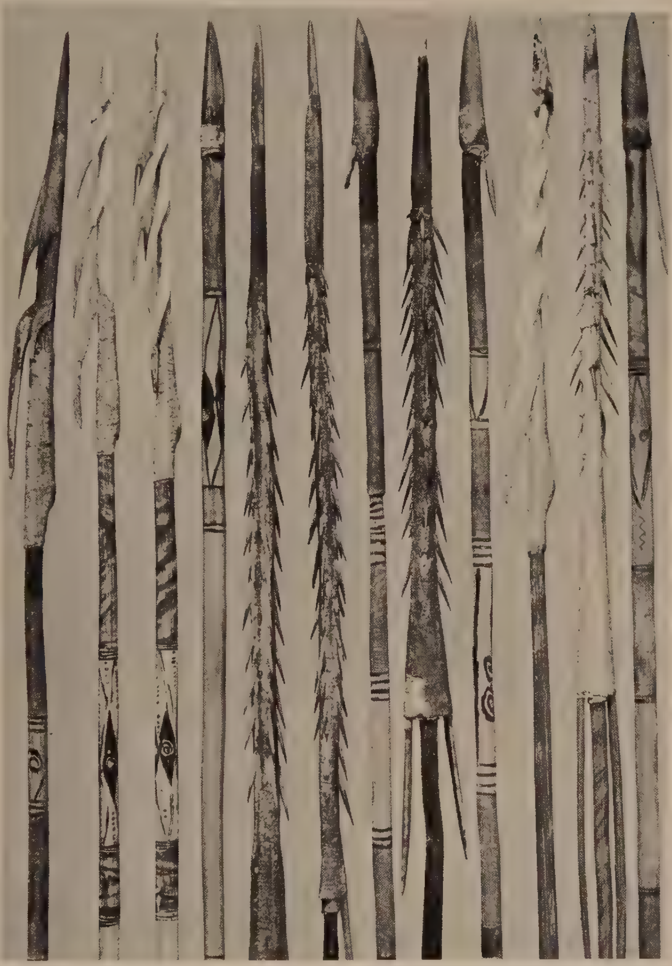
He was bearded, clothed only with a shell, and was emotionally aroused. A series of advances and retreats now ensued, as I attempted to make contact with him to present a piece of turkey-red calico. Peck meanwhile sought to make a deathless film record of our first meeting with the renowned head-hunters.

Soon this first aborigine was joined by

six others. They were all in a great state of nervous excitement. They would not permit us to approach near to them, but kept up a continuous jabber, accompanied by long-drawn-out whistles, exactly as we do when too overcome by wonder to speak. Thirty or forty minutes elapsed after the time of landing before I was able to hand the enticing flame-colored cloth to a bearded patriarch and give him a reassuring pat on the shoulder. From this he cringed and dodged away.

Pemberton now found a short length of chewed sugar cane on the beach and made signs that we wanted food. Immediately there was a dash to the rear by most of the score of savages now assembled, and soon they returned with armfuls of cane. A brisk bartering took place and soon we had good specimens of six varieties of cane.

This business calmed the crowd, which now numbered 30 or 40; but most of them kept a safe distance away. Several venturesome spirits, with the brave man who first appeared, grew bold enough now to touch our khaki clothing. They whistled as before and exchanged confidences in amazed tones. I was startled when one cannibal calipered my leg in a professional manner and otherwise conducted himself like a judge in a stock show.



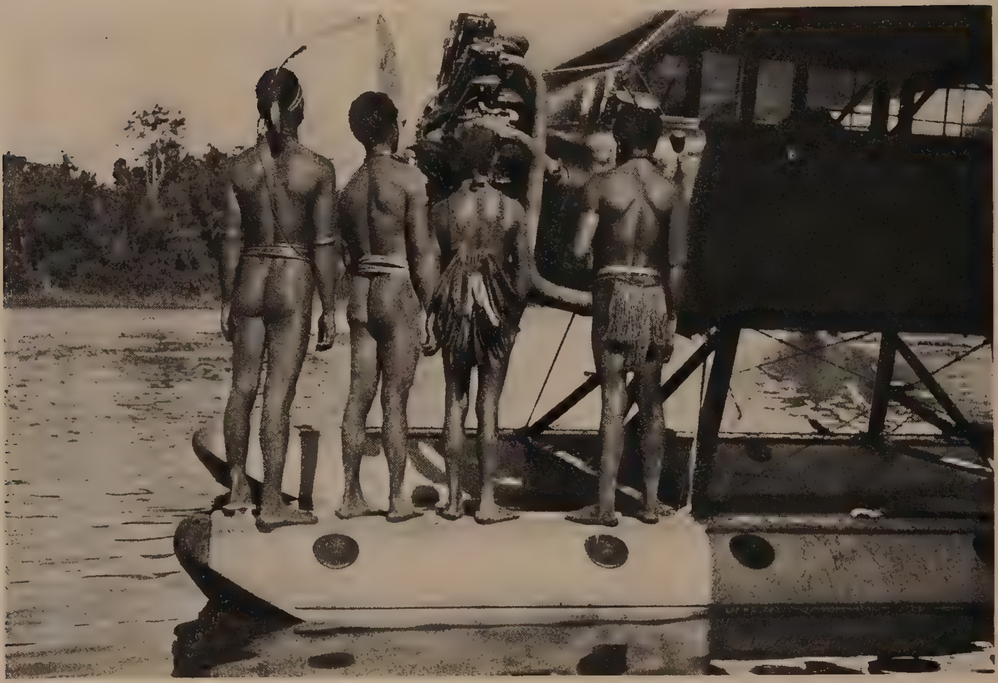
Photograph by James F. Brewer

AN ASSORTMENT OF ARROWS COLLECTED IN THE MIDDLE FLY RIVER DISTRICT

These weapons are tipped with carved cassowary breastbones and cassowary claws and are barbed with spines from the dorsal fins of fish or porcupine quills. The shafts, made of stems of Eulalia and wild sugar cane, are not feathered; consequently the flight of such arrows is winding and confusing to the human target, but true to the mark (see, also, text, page 298).

STUFFED HUMAN HEADS OFFERED IN TRADE

Now the leading spirits among them began to bring out trophies. These included their most prized possessions—*stuffed human heads!* They indicated a desire to exchange them for the trinkets we displayed. Fishhooks, safety-razor blades, empty cigarette tins, and colorful cloth captivated them, and they seemed to consider a hinged flat tin the equal of any of their possessions. We had been cautioned against wholesale traffic in heads, as it might stimulate the local business of taking them. It was interesting to note, however, that for a mere trifle, in our estimation, a warrior would part with these



Photograph by R. K. Peck

WHEN THE PLANE HALTED AT THE JUNCTION OF THE FLY AND OK-TEDI, NEGRITOS VENTURED ABOARD

mute but ghastly evidences of his prowess. We did not see them cut off any heads or dress them, but we understood the pantomime with which they endeavored to convey to us the method.

One grinning savage complacently related with obvious relish how he had made away with the man whose remains he now used realistically to punctuate his remarks. It was an ambush, evidently. We could piece together the story readily enough on perceiving that the blow was struck behind. Most of the skulls testify to this.

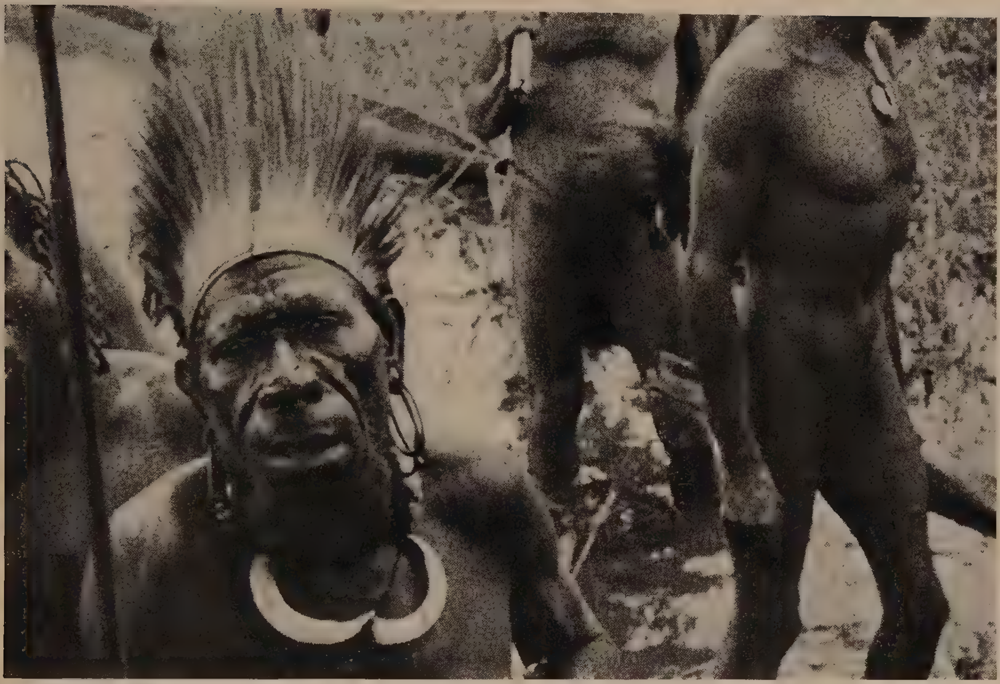
After the arms of a victim have been cut off, the body is partly severed near the middle and the skin worked up over the head, like pulling off a sock. The vertebræ of the neck are next dislocated by a violent side jerk and the head cut off. The brains are removed through holes in the skull, and all adhering flesh that can be conveniently scraped off is also removed. The armholes are darned with thongs and the drying and curing process is accomplished by smoking over a fire.

The stuffing material is coconut husk fiber and clay, a large lump of which protrudes from the open mouth, making the victim look as if he had choked on a baseball (see illustration, page 330).

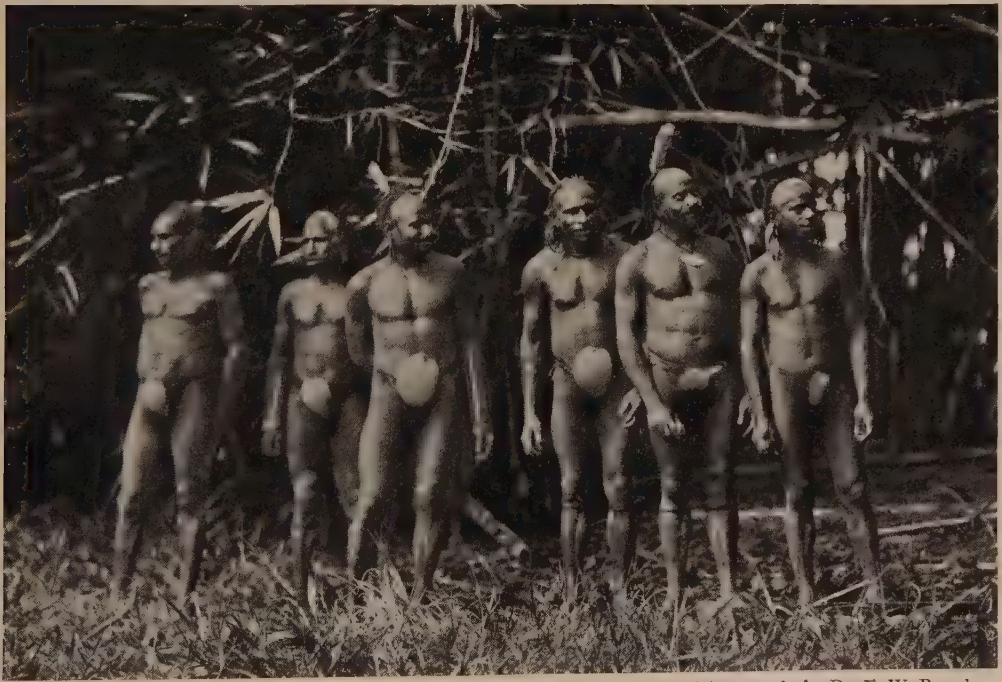
By stuffing it with mud a head is enormously distended longitudinally, until it resembles a horse more than a human being. The skin of the nose is cut in strips and braided, being fastened again to the upper lip, where, reinforced with a loop of rattan, it serves as a convenient handle for carrying the trophy. The finished product on the constricted pedicel-like torso is now ready for display or use in the childish diversions of these primitive folk.

Certain parts, our informant continued, are quite delectable to the palate.

As to the continuance of cannibalism: Many areas are not yet under Government influence, and where cannibalism has existed for thousands of years it still persists. The Papuan follows the precept and example of his forbears. Head-hunting is not an everyday affair, yet many of the people of the interior probably meet their fate in this manner. Much time may intervene between head-hunting raids on a wholesale scale, but the native seems to give a good deal of thought to cannibalism at all times, and it is noteworthy that the



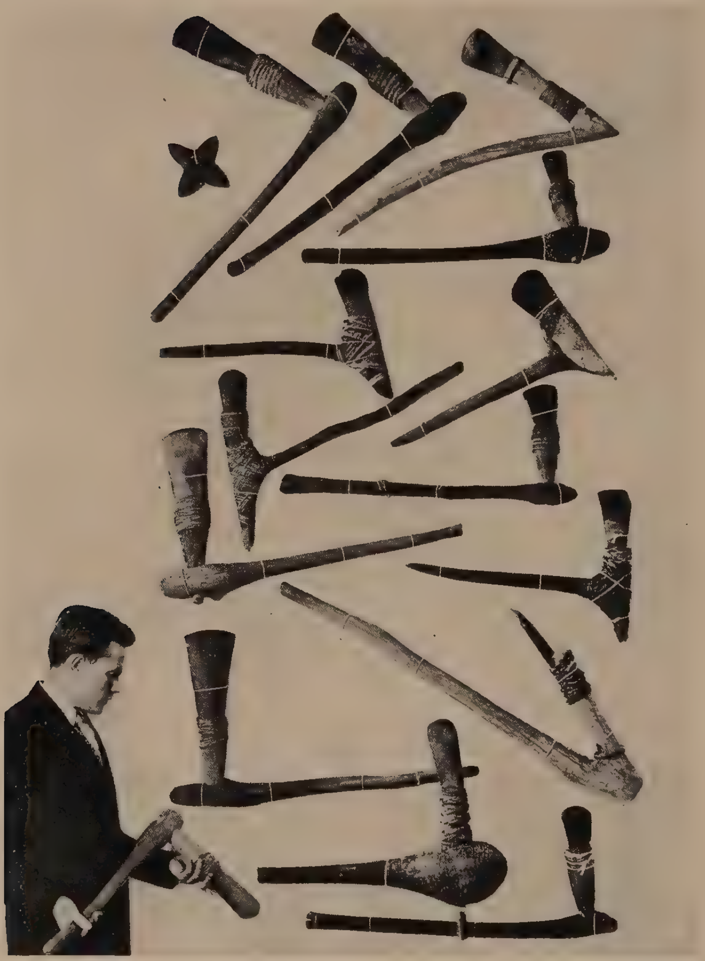
THE HEADDRESS OF A LAKE MURRAY NATIVE, MADE FROM BIRD-OF-PARADISE FEATHERS



Photographs by Dr. E. W. Brandes

PERFECT PHYSIQUES DISTINGUISH THESE NATIVES OF THE FLY RIVER PLAIN

It took much persuasion to keep the head-hunters in line and quiet long enough to be photographed. Although they live 300 river miles inland from the ocean, their large white aprons are made of sea shells.



Photograph by James F. Brewer

THESE STONE AXES HAVE SHAPED MANY A NEW GUINEA CANOE

Among the trophies brought to the Smithsonian Institution in Washington, D. C., by the author is this unique collection of weapons and implements. At the upper left is the head of a star club, used to give the final fatal blow to a victim. It comes from the Strickland River region. The axes have blades of smooth green stone of razor-edge sharpness. They are attached to the handles in such a way as to enable the user to change the angle of his blade at will by merely shifting the position of a wedge.

middle and upper Fly natives are never seen without their arms.

COLLECTION OF BOWS AND ARROWS BROUGHT TO SMITHSONIAN

We obtained many weapons here for the Smithsonian Institution at Washington. The bows are of split bamboo, quite unlike the black palm bows of the Delta. They are about three inches wide and seven to eight feet long and are bent with the hollow side out. The bowstring is a flexible strip of split bamboo. Such a bow in the hands of a well-built savage will drive an arrow more than 200 yards.

The arrows used by these folk are masterpieces of fiendish creation. Those used for fighting are tipped with the long, straight claw from a cassowary toe, or bones from the wallaby, cassowary, or pig. Most of them have recurved barbs of bone fixed to the shaft with fiber and gum, so that the arrow cannot be withdrawn (see illustration, page 295).

The tips of some arrows are eccentric, and it follows that when they hit an obstruction they are deflected and cannot be pushed through. The result is that the filthy point, which may have been steeped in decaying meat, remains inside and sets up septic poisoning; so, if the victim does not bleed to death shortly, he is doomed anyway.

The long points made of cassowary breastbone are carved in a series of jagged, recurved barbs two to four inches long.

The most diabolical arrow of all is provided with bone tip and a hundred or so straight barbs, made of porcupine quills or spines from the dorsal fin of fish, extending in bristling array for about 15 inches back from the tip. They are set in a sort of cement that may be hardened latex of some tree. Hunting arrows are pointed with bamboo bayonets or slender, beautifully turned pencils of black palm

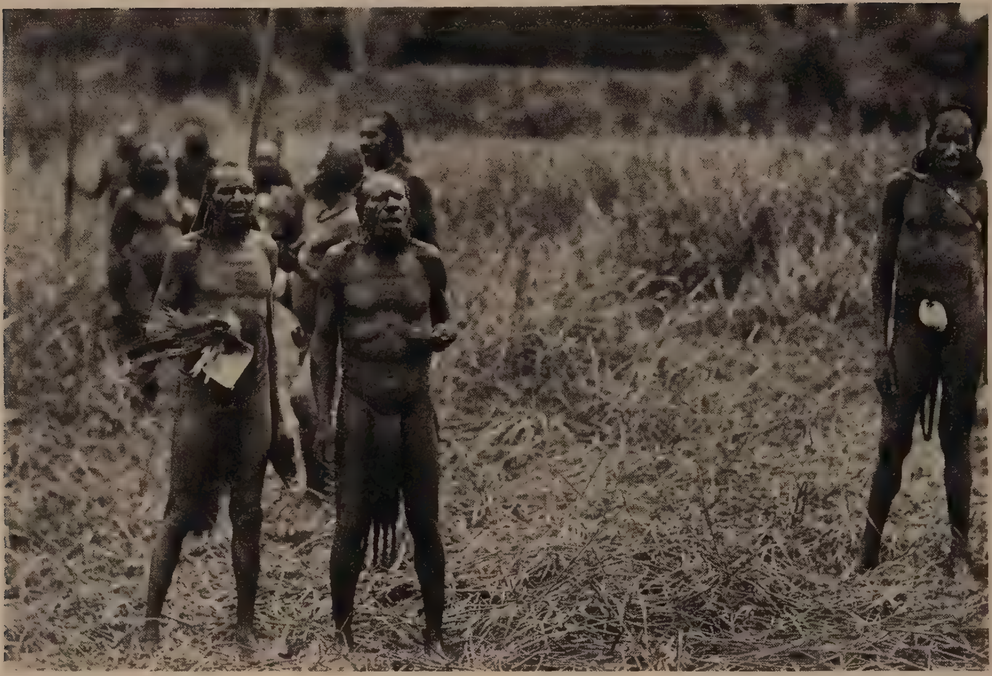
THE SEAPLANE ALIGHTS IN THE FLY RIVER FOR MORE FUEL

After a record flight, the aviators, with gasoline tanks practically empty, were contemplating a forced landing when, by happy chance, they sighted the Expedition's supply ship *Elevala.*

Photographs by Dr. E. W. Brandes

A FLY-RIVER GARDEN PHOTOGRAPHED FROM AN AIRPLANE DURING A TROPICAL RAIN

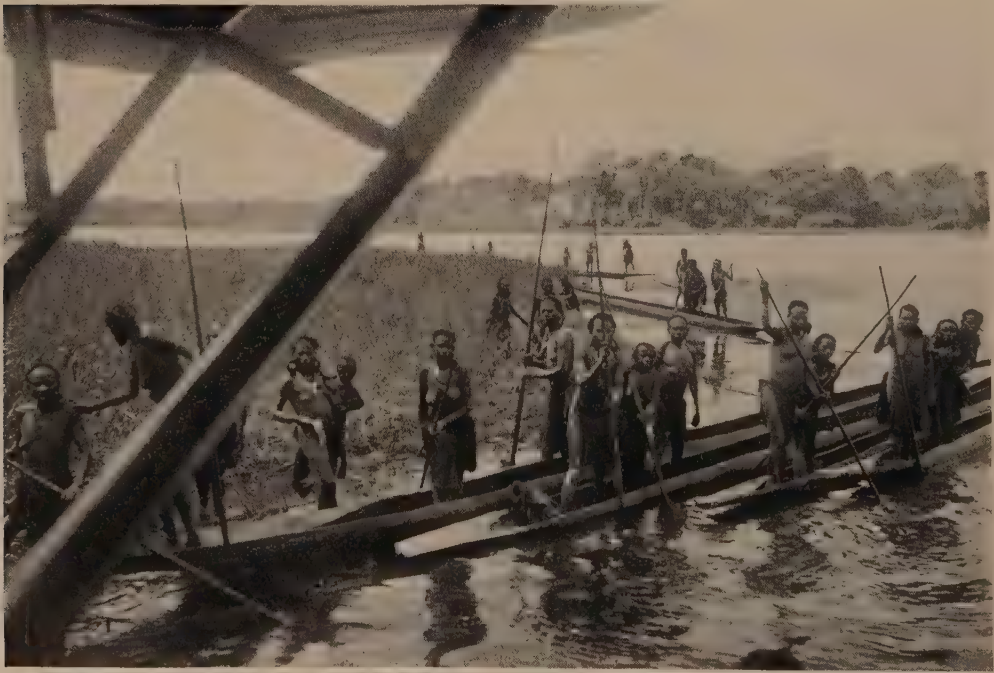
At the upper right are rows of banana plants growing on ridges separated by drainage ditches six feet deep. The white rectangles are parts of the ridges which have not yet been planted or upon which are growing immature banana plants. The drainage ditches are so deep that the natives place logs (the white sticks) from ridge to ridge to enable them to cross.



Photograph by Dr. E. W. Brandes

REGISTERING CONSTERNATION AND AMAZEMENT

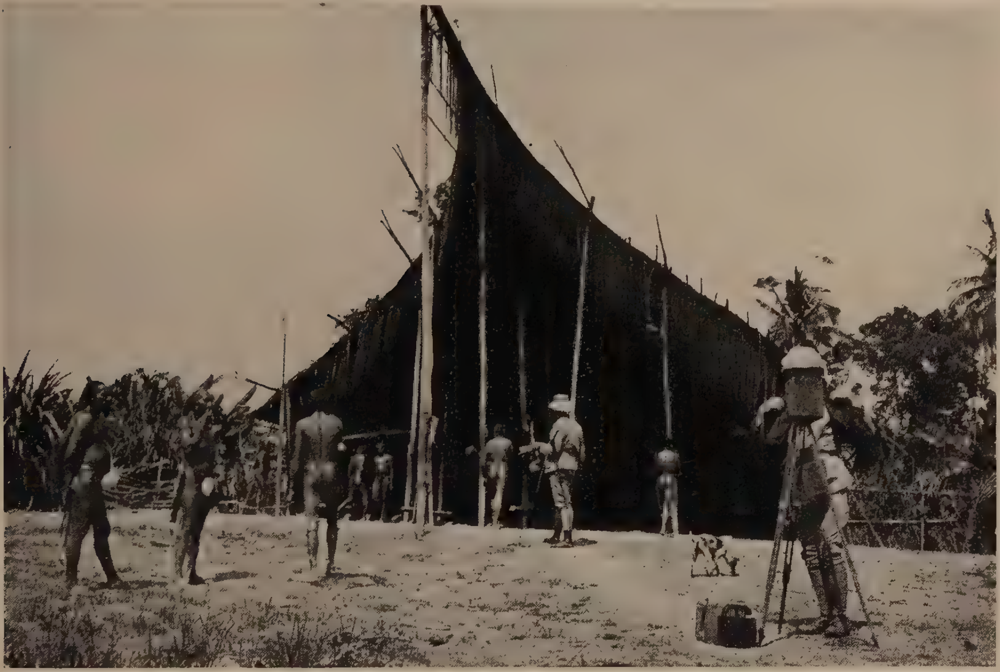
The expressions on the faces of these Lake Murray savages are due to the fact that, for the first time, they have just seen an airplane descend and a white man climb out of it. The man at the left holds a bird-of-paradise plume.



Photograph by R. K. Peck

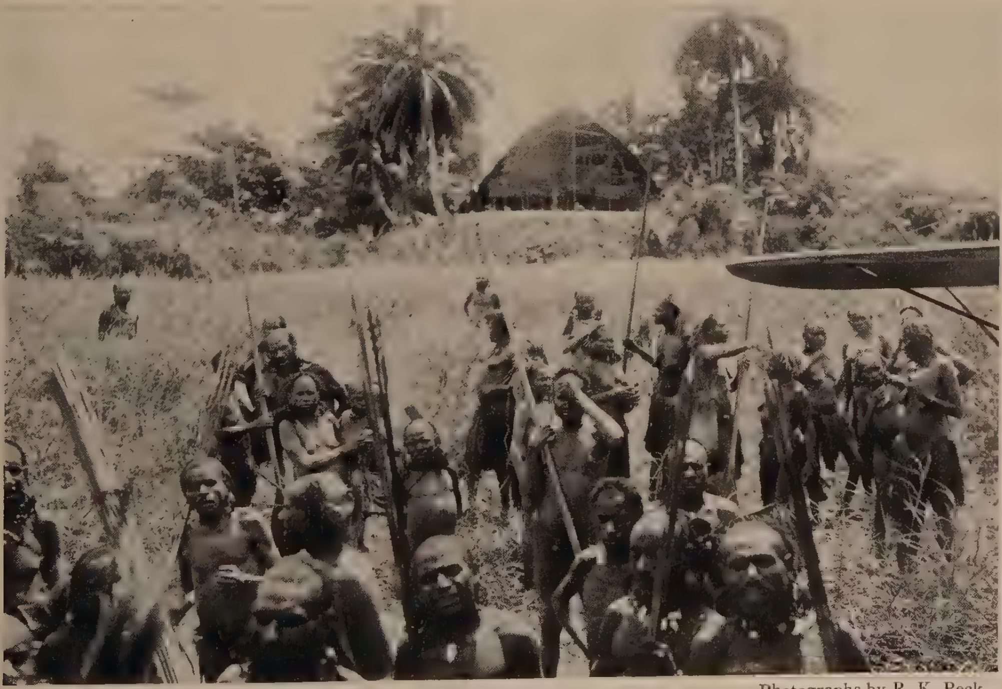
WHENEVER THE PLANE ALIGHTED, NATIVES HURRIED TO SEE IT OR FLED FROM IT

In dugouts these Lake Murray savages swarmed up to see the "big hawk." When women and children arrived with the warriors, the members of the Expedition felt relatively free from attack; when there were prospects of hostilities, the men kept their families in the background.



THE DUBU HOUSE IS TABU AGAINST ALL WOMEN

The odd structure, for men only, stands in a village on a small body of water near Lake Murray. The town had never before been visited by whites, and throughout the Americans' stay the natives were in a state of nervous excitement.



Photographs by R. K. Peck

ARMED CANNIBALS, VISIBLY EXCITED, GET THEIR FIRST VIEW OF WHITE MEN

The spearmen are from an island village near the east shore of Lake Murray. In the background is a dubu, or council house (see above, also, text, page 290). At the right is the wing tip of the author's plane.

Photograph by R. K. Peck

A LAME NATIVE EXAMINES THE AËRIAL VISITOR

He bears many frightful scars, apparently from cuts in battle. The aged, the lame, and the halt were seldom seen in New Guinea; apparently they are unable to survive the continual warfare and raiding for heads.

and other wood. All arrows are shafted with straight jointed stems of tall grasses, including *Miscanthus sinense* and *Saccharum spontaneum,* a wild sugar cane.

Axes and adzes for cutting down trees and making canoes resemble in shape our steel axes and are generally made of the same material as the clubs, a smooth, dark-green stone (see page 298). A dirk made from the femur of the cassowary is common, the double-knobbed end, where it is articulated with the pelvic bone, making a convenient handle.

These natives gave what we considered evidence that they had never seen white men before. Their fright and amazement and their willingness to part with possessions of value for little or nothing in return were in great contrast with the attitude of the inhabitants of villages on Lake Murray proper, who quickly became insolent and "cheeky."

We later visited seven or eight other villages on Lake Murray and on the other lakes and rivers in the vicinity. Lake Murray has been visited a half dozen times since it was discovered, in 1913, mostly by Government parties, and we found the natives there to be so sophisticated as to demand "zingy-zingies" in trade for stalks of sugar cane or their other trifles. With the help of their pantomime, we interpreted "zingy-zingy" to mean a trade ax.

WOMEN OF THE INTERIOR SEEN FOR FIRST TIME

We were much amused by the grave antics of one Lake Murray man, who sought to express his desire for a mouth organ. He blew violently into a discarded cartridge box, with its neat double row of small square compartments, and sawed it back and forth between his lips.

These people were extremely curious to examine the interior of our plane. They crowded onto the pontoons in such numbers that I had to push them violently into the lake several times. A man afflicted with a repulsive skin disease concluded I was playing a game, and upon my pushing him back into the water with the admonition, "Get down, get down," he would repeat, "Gedahn, gedahn," and thereupon get up!

At this place we saw women for the first time in the lake region. Heretofore women and children had been kept back in the bush during our visits, a cause for apprehension, it has been related, as the women are always bundled off when violence is expected.

The women we now saw were scrawny, forlorn creatures, not at all like their men, who are in general stalwart and well-muscled, some being really fine physical specimens. Moreover, the men of this region carry themselves like masters of the earth. They have a confident, self-assertive air that was strongly impressed upon us, after having seen the poor slinking, cringing creatures in some other areas. They frequently have aquiline, high-bridged noses, thin lips, and a decidedly Semitic cast of countenance.

The women came close and the men, not relinquishing their more advantageous positions, crowded still closer and jostled us.

And here we met the genuine essence of Papua! The odor of these people approached the variety encountered in the cathouse of the zoo in winter. One of the women was nursing a small pig. This is a common practice, as the hunter has no recourse but to turn piglets over to his better half to suckle when he kills the mother in the bush.

Photograph by R. K. Peck

THE VORACIOUS PAPUAN BUSH PIG

This wary animal, though now numerous, is not indigenous to New Guinea; it was probably introduced centuries ago by those roving mariners, the Polynesians.

EXPEDITION MEMBERS ARE INVITED TO A "SAMBI"

At one village the men were very insistent that we join in a *sambi,* which we took to be a dance of some sort, and in a suggestive manner indicated that there would be provided dusky partners. Although sorely tempted to make observations on the more intimate social customs of these strange beings, we declined, as it is generally assumed that these rites often have for their purpose the betrayal of strangers, natives of course, who are enticed by seductive promises.

At the word sambi, all of the men burst into a chant with not unmusical voices. There was no melody and no harmonious chords made up of notes of different pitch, but simply a long-drawn-out "O-o-o-oh" in unison, like a complete symphony orchestra tuning up following the sounding of a keynote.

During this performance the strong jaws and even white teeth of many individuals were much in evidence. Betel nut is chewed here, as in most other parts of New Guinea, but it either does not result in discoloration of the teeth to the extent noticeable elsewhere, or there are many total abstainers.

Photograph by R. K. Peck

LAKE MURRAY NATIVES FLOCK ABOUT THE PLANE TO BARTER

The man in the foreground, wearing a woven cap, persisted in climbing upon a pontoon. Again and again the Americans pushed him off, but he took it good-naturedly and seemed to think it a game (see text, page 302).

Our interesting first visit with the head-hunters was terminated by approaching darkness, and we gathered our bundles of sugar cane, ethnological and botanical specimens, and cameras and stowed them in the plane. As we made these preparations and untethered the winged steed, there was a prompt movement backward on the part of the natives, and a frank expression of mistrust again appeared in their faces. Peck "gave her the gun" and, as the roar of our 425-horsepower motor split the tropical air, our cannibal friends rushed up the bank and took headlong flight into the bush. A mere handful remained in sight as we flew away.

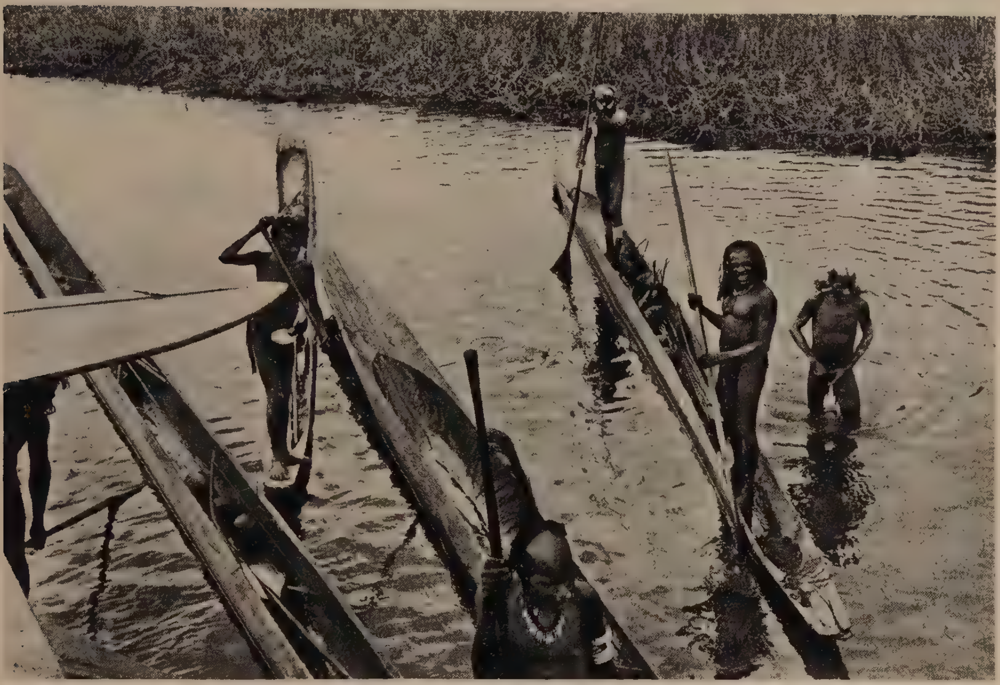
Study of the natural history of New Guinea is a job for specialists, and the field is a fertile one. Primarily, of course, we came for cane; yet, important as that quest was, it was only natural that the strange tribes we bartered with were even more interesting than the plant life we found.

The next area we visited forms a quite distinct entity geographically, with sharp differences in its flora and other natural features. Its inhabitants comprise a group well defined culturally and racially quite unrelated to those previously met. I refer now to the region of the upper Fly River and its tributaries, the Ok-Tedi, Palmer, and others.

A VISIT TO REMNANTS OF A VANISHING RACE

Here the people are Negritos, one of the remnants of a vanishing race. They must be of great antiquity, for they survive in isolated racial islands in New Guinea, Africa, the Philippine Islands, and a few other places.

These diminutive, likable people must be regarded with compassion. With the advance of civilization and the gradual surrender of their territory to more aggressive and enterprising races, they will assuredly perish, for they are physically and mentally unfit to compete in any modern economic order of society. Their free ways of life differ so from plantation routine that it is hard to see how they can



Photograph by Dr. E. W. Brandes

FROM HUGE LOGS THE LAKE MURRAY SAVAGES HEW AND BURN OUT THEIR LONG, NARROW CANOES

fit into any future activities, even in an agricultural or pastoral country. They may hybridize with other races; indeed, they have to some extent in this region; but their identity as a race will be lost unless a preserve is staked out for them in which to carry on essentially as they are now.

We left camp on July 24 to collect cane in the pygmies' land. Peck, Champion, and I formed the party.

Following the Fly in a northwesterly direction, we saw scores of lagoons and lakes bordering the river for the first 20 miles above Everill Junction. From an altitude of 7,000 feet, we saw a vast plain broken by Lake Murray and other lakes to the east and numerous sizable lakes to the northwest, which are not shown on any published map. Lake Murray, 40 miles long, was the largest lake then in our range of vision (see, also, text, page 290).

AMONG THE PYGMIES WHO DWELL IN TREE-TOP HOUSES

About 100 miles by river above Everill Junction the country becomes rolling and heavily timbered as far as the eye can see. And now we saw a new style of habitation, built in little clearings that lay back from the river and hidden in the jungle. These were the homes of pygmies. Their houses are built in trees and on the tops of tall poles, about 50 feet above the ground. Here we were flying north, up the Ok-Tedi, and we saw many of these hidden villages in clearings from one to eight miles back from the stream. Obviously there is a considerable population in this area.

Toward noon we turned back and flew across to the Fly and proceeded up that stream. Here we attempted to get above the clouds to catch a glimpse of the stately Victor Emanuel Range to the north, but after mounting to 12,000 feet and still flying blind through the clouds, with temperature 39° Fahrenheit, Peck decided there was no top to them and nosed down to clear air. Again we saw clearings with tree-house villages, but they were not so numerous here as on the Ok-Tedi. These cleared places were usually well back from the river and could be seen from the air only.

The Fly River had now narrowed to a

Photograph by Dr. J. Jeswiet

NEW GUINEA LEAF-HOPPERS, NOT BUTTERFLIES

rushing stream, not good in case of forced landing; so we turned up a tributary, the Palmer River. The mountains were now quite close.

EVERY PYGMY DWELLING IS AN ARSENAL

We continued up the Palmer until it became a narrow torrent with a canopy of overhanging trees. There were no signs of habitation, so Peck turned back southward, to my great relief. Landing in those trees would have ended us. We were then about 600 miles from the nearest white settlement and more than 300 miles from our base camp. We had reached the very source of the great Fly River and had seen what we set out to see—the character of the country and the indications of native settlement where sugar cane might be concentrated.

After we turned to fly back down the Palmer I directed Peck to land at a pygmy tree-dweller town we had seen on our way up. It stood on the Fly, just below its juncture with the Ok-Tedi. That same day we were to learn what an emotional shaking-up we gave these pygmies when we zoomed over their tree houses. No doubt they are still telling of the big hawk that came with thunderous noise out of the upper air to carry them off.

We landed, luckily, without crashing into any of the partly submerged logs floating rapidly downstream, and taxied into the backwash of a huge whirlpool which had carved a recess in the river bank in front of the village of tree houses.

We all got ashore after more or less difficulty, and Champion and I climbed to the jungle-covered bank 20 feet above us and headed for the village.

A crooked bush path brought us to the clearing, and I had my first view of one of these extraordinary habitations. Its floor was about 45 feet above the ground and its chief support was the trunk of an enormous tree, supplemented by its aërial roots and long poles brought from elsewhere (see pages 289, 291, 309).

There was no sound. The place seemed deserted. I was foolish enough to walk below it for closer examination. I know now just how foolish I was. Two hours later it was revealed that this hut was still full of savages.

Each of these dwellings is a veritable

arsenal of large rocks, arrows, etc., which the beleaguered occupants shower on attacking parties through small holes in the walls and trapdoors in the floor. For some reason my head was spared. Still not knowing that anyone was in the tree house, we went back to the river's edge, at a point that seemed a landing place for canoes. Upon reaching it I heard a shout from Peck, who was still in the plane, which lay around a bend some 200 yards below us. He was calling attention to two slender canoes, loaded with people, paddling feverishly for the opposite shore about a mile upstream.

Photograph by R. K. Peck

TO PROTECT HIS PLANE IN THE WILDS, PILOT PECK SLEPT ABOARD

In the cabin a pneumatic mattress was unrolled and inflated. At the left is the folded mosquito net. Others in the party camped ashore.

PYGMIES ARE THE DANDIES OF THE PAPUAN WORLD

We called in our most seductive tones; we even used the magic word *sambio* (peace), which worked well on Lake Murray. Finally, though not till they had crossed the stream and got under the shelter of overhanging boughs on its far side, the fleeing pygmies appeared to pause and regard us with curiosity. This was a toehold, anyway; so we waved red calico at them.

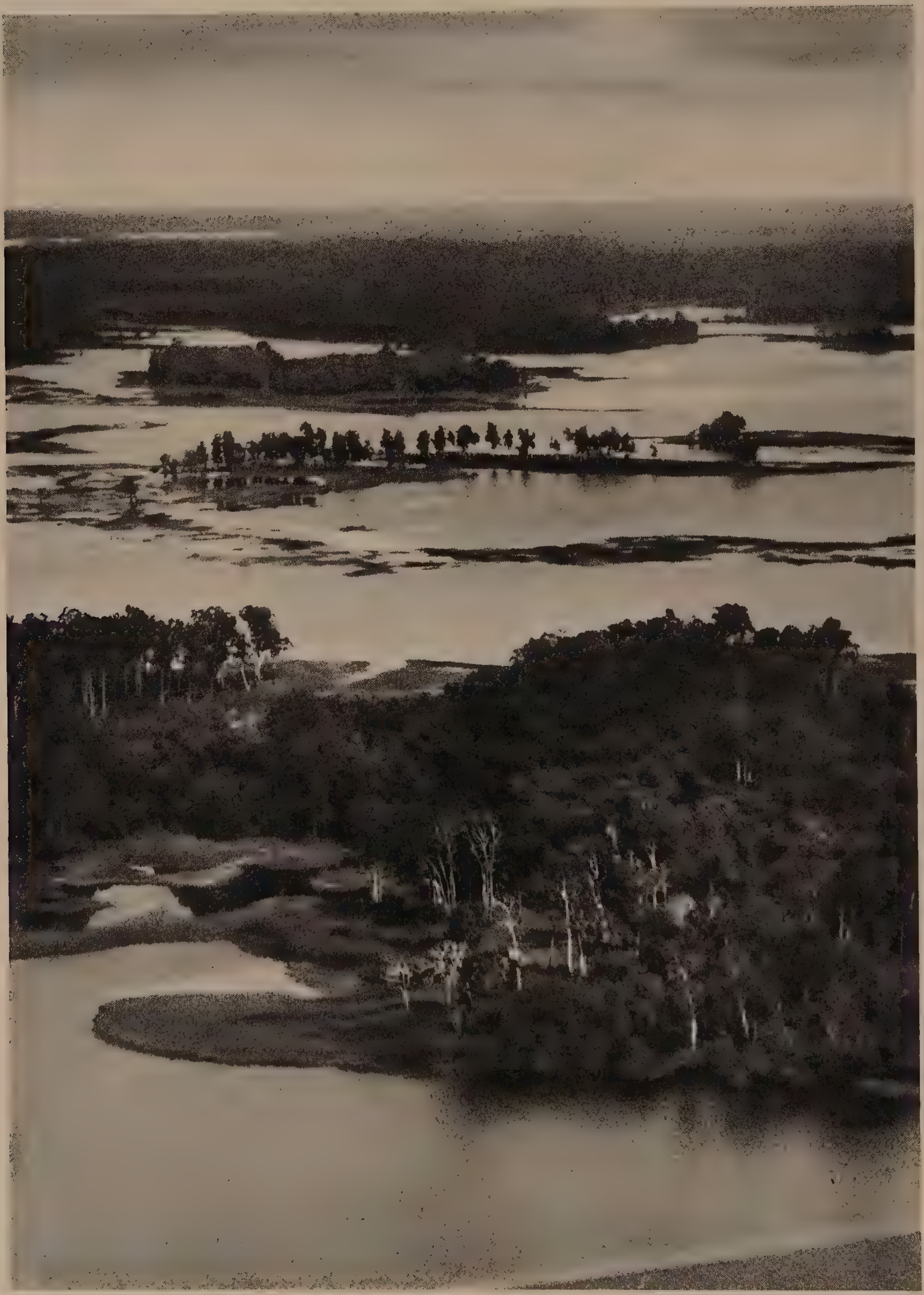
For a long time no move was made. Then we saw them unloading some pigs and women from their canoes.

We kept up our friendly calls and gestures. Finally a canoe with four or five men in it put out and cautiously approached. When their long craft got close enough for us to see their faces, we smiled and held up our empty hands. As their canoe scraped the mud bank, we walked out, smiling, and patted the little men on the back and shoulders.

The hair of the heads and beards was decidedly kinky and rather short, a much closer approach to that of the Negro than any we had previously encountered.

Looped black cassowary quills about six inches in diameter were worn for earrings. Flying-fox claws, in some cases tipped with fur or feathers, projected upward from holes in either side of the nose, the *tout ensemble* being capped by a headdress of cassowary feathers (see illustration, page 293).

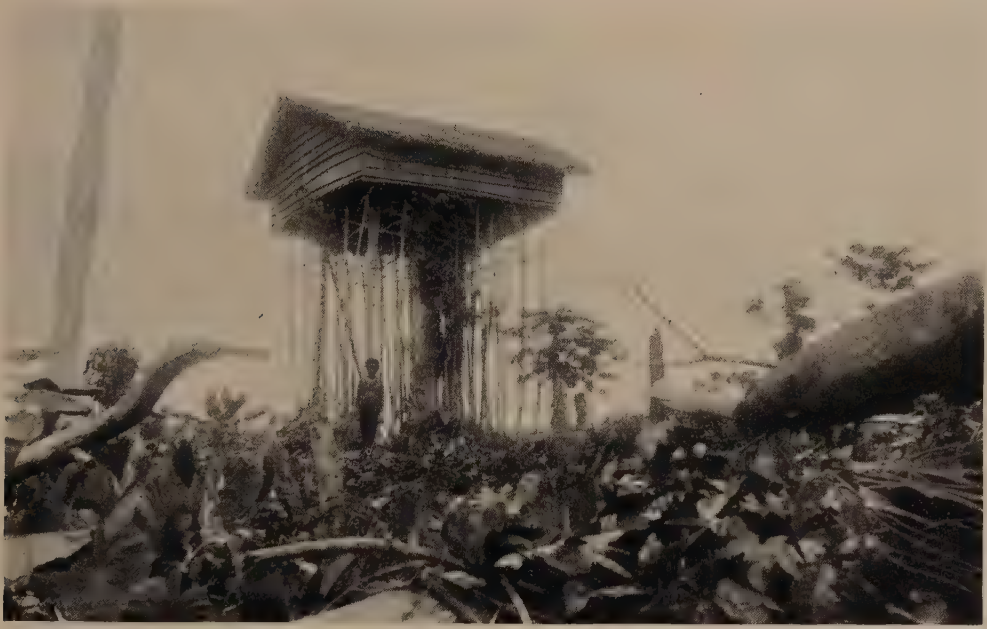
It was now that we learned that the tree



Photograph by Dr. E. W. Brandes

PERILOUS TO WHITE MEN AFOOT, ISLAND-DOTTED LAKE MURRAY COUNTRY FROM THE AIR IS A REGION OF RARE CHARM

In these waters blooms a beautiful coral-pink lotus whose flower is sometimes 12 to 14 inches in diameter. The author dived into murky waters seven feet deep to get the roots of one plant and, after nurturing it at Base Camp for a week, flew with it to Kikori, dropped it overboard in a small parachute, and it was planted in a garden at that post, where it is now thriving. From this point it may be brought to gardens throughout the world.



Photograph by R. K. Peck

AN UPPER FLY RIVER NATIVE PERCHES HIS HOUSE HIGH IN AIR

Behind the man is a notched-pole ladder, by which he climbs to his home. Surrounding trees, felled in a confused jumble, form a sort of *chevaux-de-frise,* preventing enemies from rushing the tree dweller's home (see text, page 311).

houses were not empty, for men began to swarm down from them. After exchanging gifts I led them to a small patch of sugar cane and made signs for them to cut me some. Then I indicated a desire to visit the village we saw across the river.

After some hesitation, because their women and children were assembled there, they consented to take us. Champion and I entered the tippy canoe, and with two paddlers in the bow and two in the stern we were shot across the turbulent waters.

At the moment of landing, a crocodile raised its warted and malevolent head beside me. We often had these reminders that the waters concealed formidable enemies and had to be constantly on the alert. It is said crocodiles have grabbed men, even from the security of their canoes.

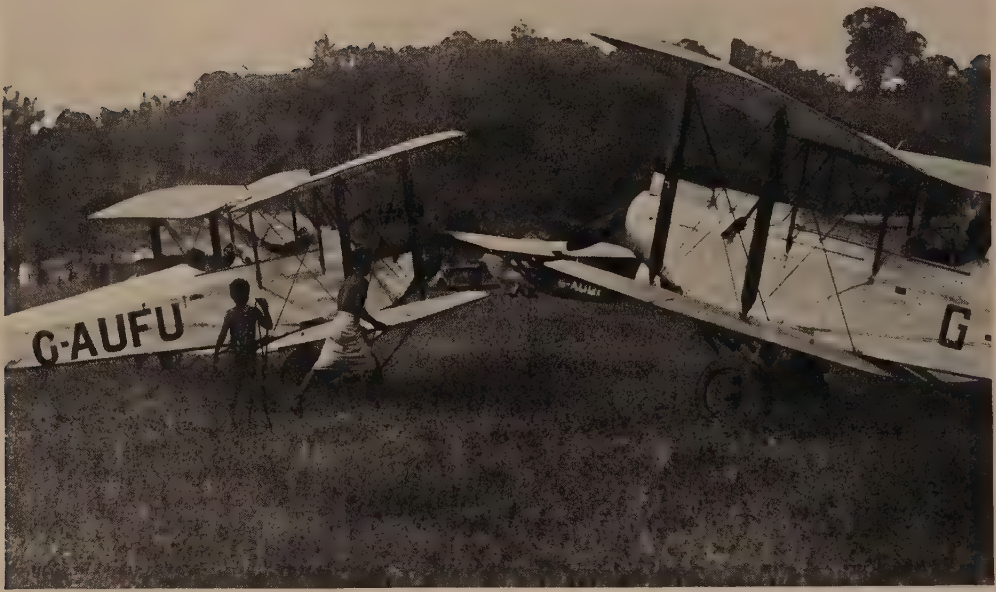
This village had three tree houses, all like the one across the river. I gathered cane fast, as the sun was now sinking. I got five varieties. Then we bartered for weapons and ornaments. The pygmies seemed pleased with the matches, jack-plane blades, safety-razor blades, beads, and cloth which they got from us.

The timid little women, about the size of our half-grown children, were by this time satisfied that our mission was peaceful. They emerged from hiding to view the white-skinned strangers, who must have seemed like giants to them. Unlike the men, they wore an apron of shredded palm leaf. It was four inches long in front, but considerably longer behind.

LITTLE FOLK PROVE FRIENDLY

We were led to note with pleasure the friendly, compatible natures of all these little folk, so utterly different from the fierce dispositions of the general run of natives we had fraternized with in the lake region during the previous week.

We returned to our plane, and pygmies helped us make a clearing on the bank where we could pitch our tent fly. After dinner, men from the village squatted in a circle before the camp fire just in front of the tent and we were now treated to one of the real surprises of the trip. In the light of the fire, flickering with eerie effect on two shining black faces before us, one of the men spoke up out of the guttural babel of voices and addressed us in perfectly good Malay.



Photograph by Dr. E. W. Brandes

A GOLD RUSH BRINGS AUSTRALIAN PLANES TO NEW GUINEA'S OUTPOSTS

Miners, prospectors, mail, and supplies are carried from coast to gold diggings. These two biplanes at Lae are ready to fly to Edie Creek goldfields, 55 miles back in the mountains.

Photograph by R. K. Peck

MADANG, IN NORTH EAST NEW GUINEA, WAS FORMERLY A GERMAN SETTLEMENT

On their daring flight from Port Moresby, over the high mountains, to the north coast, the Americans carried mail from the Papuan Government to the New Guinea Territory settlement at Madang.

Photograph by Dr. E. W. Brandes

WUSSI RIVER MEN COLLECT CANE FOR THE EXPEDITION

Because these natives were in contact with German traders and officials when, in pre-war days, Germany controlled North East New Guinea, they speak a few words of German. They call small coins "marks."

This man, Jarep by name, had been over the line in Dutch New Guinea and had associated for years with a band of Malay bird-of-paradise hunters. Peck is quite proficient in Malay; so we gave up grunts and signs for a basis of real understanding.

With what delight the other Negritos welcomed this opportunity to get a tangible explanation of our presence there and to exchange ideas! We learned the native names of villages, rivers, and individuals; of their constant dread of the bad men below, and the reasons for their peculiar styles of architecture, together with much of historical interest.

Jarep said that when our "great hawk" appeared over his village all the people immediately concluded that their last hour had arrived and they would soon be eaten. They pitched themselves violently on the ground and buried their faces in the earth. It was only after they had recovered that we saw them paddling across the river for dear life, with pigs and women aboard.

We talked until about 10:30, and learned that another village, which we had sighted from the air, was within walking distance. So, with the promise of an escort to conduct us to it on the morrow, we turned in with a feeling of complete security in the land of our new friends. The natives repaired to the trees, from which we heard, during our periods of wakefulness, the sound of drums and eager, excited voices until the sun rose.

TREE VILLAGE IS PROTECTED BY HURDLES

Champion and I started through the jungle next morning, leaving Peck to guard the seaplane. We followed a well-marked trail and were accompanied by 15 or 20 of the little men, who rushed ahead to break down branches, bend saplings aside, and clear the path, for we were so much larger than the people who customarily used it. They kept up a chatter and smilingly beckoned us on when they stopped to bend down a sapling.

Photograph by Dr. E. W. Brandes

FROM ABOVE, COCONUT GROVES LOOK LIKE VAST AREAS OF GREEN MOSS

This commercial coconut plantation is set in orderly rows and is well cared for, with a lane running through it. It stands on the coast, between the mouth of the Sepik River and the important north-coast town of Madang (see page 310). The three white splotches are native villages. A meandering river makes an island at the right.

After going about five miles, it became terrifically hot in the sweltering, steamy woods. At this point we encountered what seemed like hurdles across the path. They were merely saplings, cut with stone axes so they would lie transversely 20 to 24 inches above the path, about 3 feet apart. With every step it was necessary to pick up one's feet like a high-stepping horse. After two miles of this my feet weighed at least a ton each! The pygmies bounced along on these obstructions like squirrels or cats; but when I tried this the poles broke and let me down. I could not conceive of a more effective way for the pygmies to confuse and confound their heavier pursuers until they were able to assemble for defense of their little fortresses (see page 309).

Another mile brought us to the clearing. Here were signs of activity indeed. For fully a quarter of a mile, between the edge of the clearing and the nearest tree house, there was a hopeless tangle of tree trunks extending in all directions and covering the ground for a height of from 6 to 15 feet, making it impossible to proceed except over the insecure branches and trunks.

Over this barricade of fallen jungle we

AN AIR VIEW OF FENCED, RECTANGULAR GARDENS FARMED BY SEMISAVAGES EAST OF THE MOUTH OF THE SEPIK RIVER

Photographs by Dr. E. W. Brandes

BRAVE MISSIONARIES HAVE PUSHED THEIR PERILOUS PATH INTO DARK NEW GUINEA

It was here, at Marienberg Mission, 60 miles up the Sepik River, that the Expedition met the steamer *Franklyn.* Father F. J. Kirschbaum, who founded this mission, accompanied the author and Aviator Peck to the foothills of Victor Emanuel Range.

Photograph by Dr. E. W. Brandes

CANOEMEN OF THE LOWER SEPIK STAND WHILE PADDLING

The long, fairly light canoes are very flexible. When twelve or more men are paddling, the middle portion of the canoe can actually be lifted from the water by ingenious knee-flexing and teamwork. During this feat the descending arch in the bent canoe violently slaps the water as the boat leaps forward.

eventually reached the tree house. The villagers told us their garden was a mile or two downstream, on the river bank. We could have flown there in five minutes and landed easily on the water in front of the village.

EACH PYGMY CARRIES HIS OWN FIRE-MAKING APPARATUS

We went by canoe to the garden. It consisted of taro, bananas, sugar cane, and tobacco planted in the same disorderly fashion seen in all native gardens previously visited.

Each pygmy carries his own automatic lighter, a long piece of split rattan wrapped many times about his middle (see illustration, page 292). To start fire he loops this strip of rattan around the end of a cleft stick of dry wood, with some dry punk or tinder in the cleft; then he rapidly draws the strip back and forth, in contact with the combustible material. In about 10 seconds smoke appears and the glowing tinder is fanned into flame.

About six kinds of cane were found in this garden. After photographing them and collecting specimens, we started back on the second lap of our obstacle race to rejoin Peck. Less than a half hour after toiling through that steamy jungle we were in winter temperature, at an elevation of 13,000 feet, flying above the lake plain, 50 miles away.

We had quit the pygmies with real regret, but now took advantage of a clear day to photograph and sketch from our high vantage point some of the numerous heretofore-undiscovered lakes in the eastern part of Dutch New Guinea and in western Papua.

One new lake we found and named Lake Herbert Hoover (see inset map, page 255). We so placed it on record at Port Moresby; this not because of any occult hints about political developments in the country we had left nearly five months before, but because of Mr. Hoover's sympathetic promotion of commercial aviation while heading the Department of

Commerce, and his popularity in Australia, where he formerly engaged in mining enterprises. This pretty New Guinea lake lies partly in Dutch and partly in British territory.

Here I must sketch briefly our movements, till we reached the former German New Guinea, now administered by Australia under mandate from the League of Nations.

The party now divided. Dr. Jeswiet, Mr. Pemberton, Mr. Champion, and Mr. Bannon, with about 100 carriers, proceeded afoot to the mountains behind Rigo, a station 40 miles east of Port Moresby, while Mr. Peck and I continued by seaplane to collect cane along the north coast and up the rivers of the mandated territory.

Photograph by Dr. E. W. Brandes

AVIATOR PECK AT WORK ON HIS MOTOR

In far-away New Guinea, remote from spare parts, shops, and mechanics, life depended on infinite, unflagging attention to the seaplane. On the Sepik River, near the Marienberg Mission (see page 313).

FLYING BLIND OVER MOUNTAINS AT 14,000 FEET

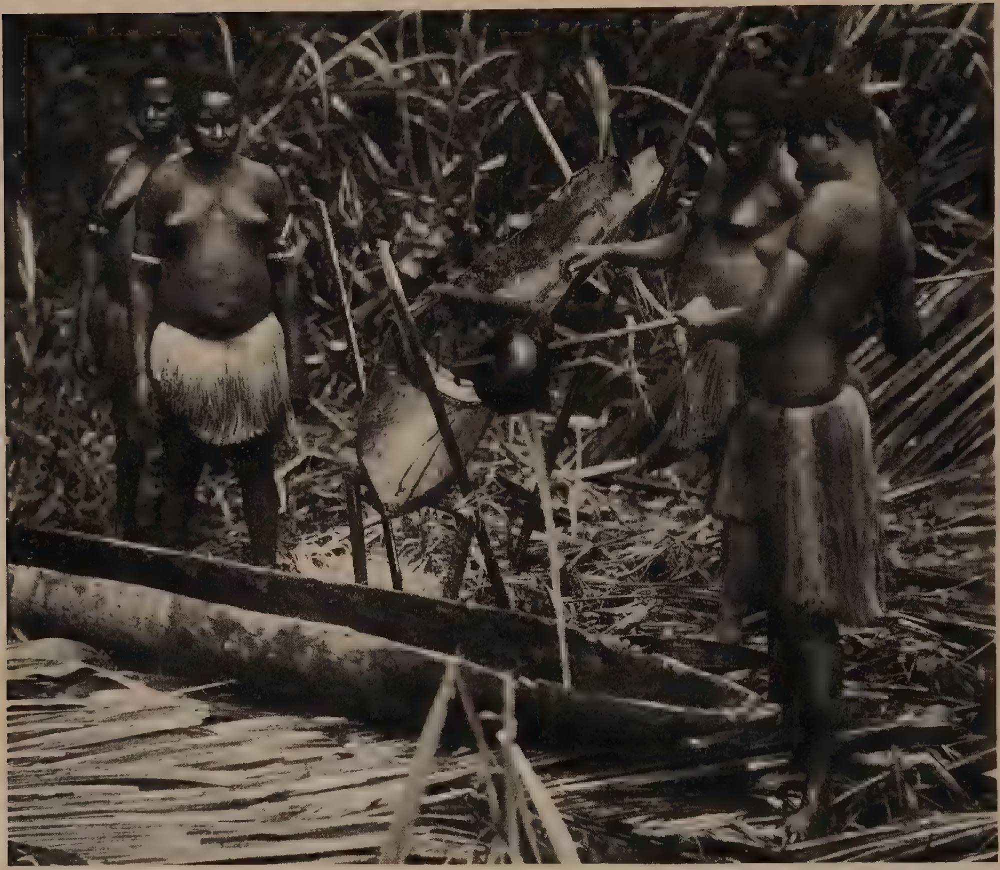
August 24 we set out to cross the high mountains between Port Moresby and Buna, with Lae, in the former German territory, as our destination. Behind Port Moresby were impenetrable high clouds; so we flew east, along the coast, seeking a clear spot for climbing over the mountains.

As conditions did not improve, we started to climb anyway and at 11,000 feet headed inland. Soon the coast plain was left behind and we were above the first range of mountains. Villages could be located on the very tops of mountains. They were near to, yet far away from, other villages, on neighboring peaks, on account of the deep intervening valleys.

Large clearings, probably for gardens, could be seen on the steep, wooded mountain slopes below these villages. Far below, rivers, like narrow silver ribbons, were glimpsed cascading through the deep valleys.

Soon we were in the swirling mists momentarily mantling the higher peaks. Through the rifts we could see the interesting panorama below.

Suddenly we were flying blind at 14,000 feet, with the wing tips barely discernible. It started to rain, and I saw Peck look anxiously at the thermometer on a wing strut. It registered 33° Fahrenheit. A



Photograph by Dr. E. W. Brandes

SAGO TAKES THE PLACE OF BREAD

To make sago in New Guinea, men first go into the swamps and fell the sago palms (see illustration, page 320). Then with sharp-edged mallets they pound the nutritious pithy stems. Reduced thus to pulp, the sticky mass is taken in hand by women, who wash out the starch grains, as shown here.

drop of one degree would mean taking a load of ice on the wings. We could not lose altitude without the danger of crashing into the side of one of the numerous mist-shrouded peaks just below.

Fortunately, after 20 minutes of suspense, we burst into bright sunshine, but a heavy blanket of clouds still obscured the mountains below. Doubtless we had now passed the highest of them. Rifts appeared in the clouds, and with relief we saw the coastline far to the northwest. Peck headed for it, and soon we were over the Musa River, which we followed to the sea; then headed northwest, to follow the coast to Lae.

The north coast is distinctly different from the south. In general the mountains are much closer to the sea, in some cases rising abruptly to great heights from the water's edge, with rocky shelves instead of sandy beaches.

We landed at dusk, in the open sea, at Lae, after a circuitous flight of five hours.

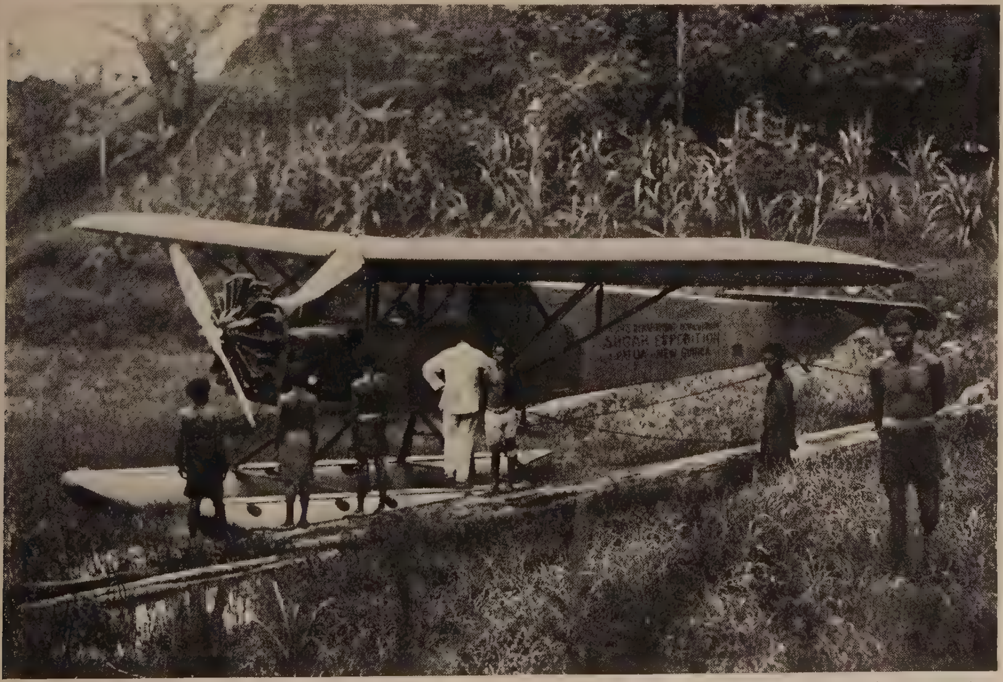
Next day we took off for the Sepik River, stopping at Madang, the chief town of North East New Guinea, to deliver the official mail from Port Moresby.

OFF FOR AMBUNTI, 260 MILES UP THE SEPIK

Ashore, we were taken in by Father Franz Josef Kirschbaum at the mission. With this German priest we were to ascend to the headwaters of the river, 650 to 700 miles from its mouth and only

THREE LONELY WHITES ARE STATIONED AT AMBUNTI

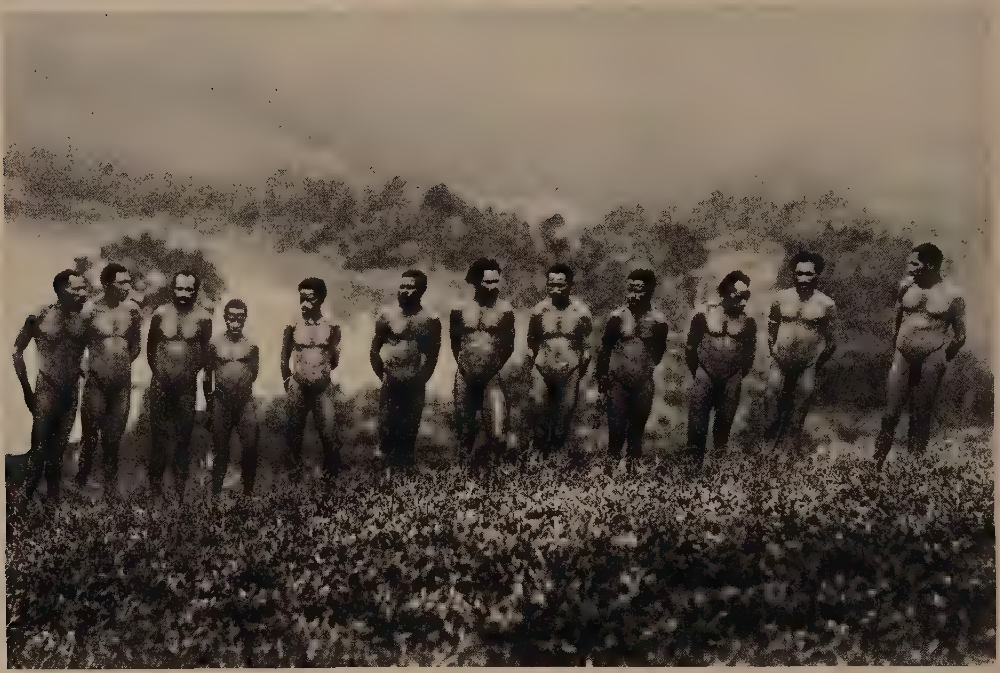
The Union Jack of the British Empire floats bravely from its flagstaff at this police post, far up the Sepik River (see, also, illustrations, pages 318, 319, and text, page 322).



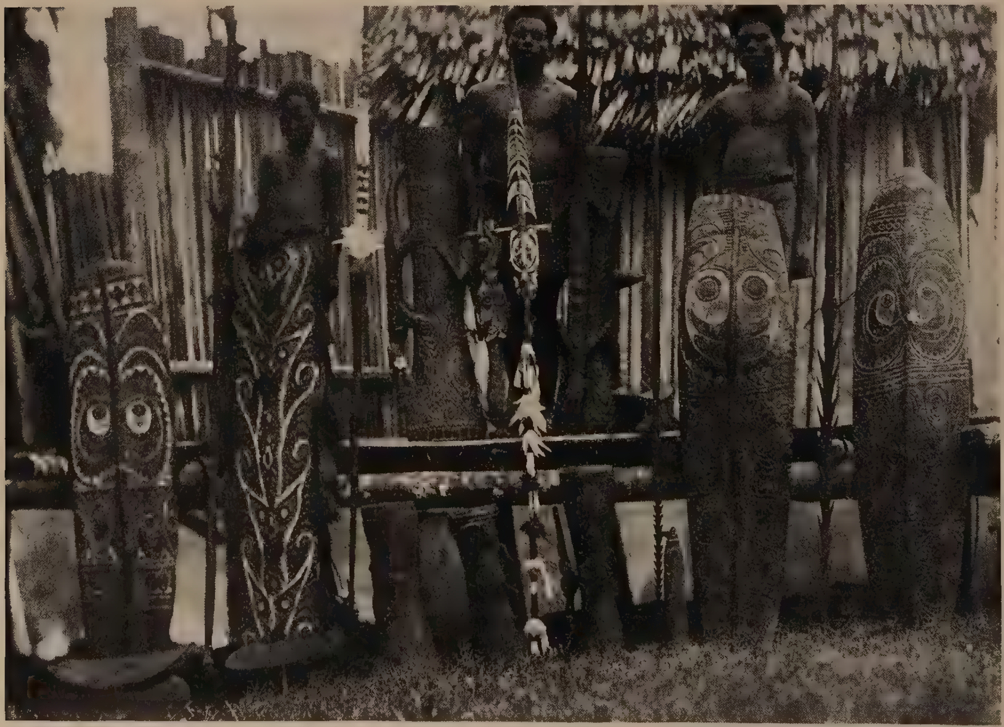
Photographs by Dr. E. W. Brandes

THE EXPEDITION'S PLANE REACHES AMBUNTI, 260 MILES UP THE SEPIK (SEE ABOVE)

On the bank in the background is a field of flourishing cane, which proved to be a variety of a new species, *Saccharum robustum* (see, also, pages 276 and 285). It is peculiar in that its flesh is red and is the only one of its kind found in New Guinea (see text, page 325).



BUSHMEN OF THE UPPER SEPIK WEAR NOT EVEN ORNAMENTS



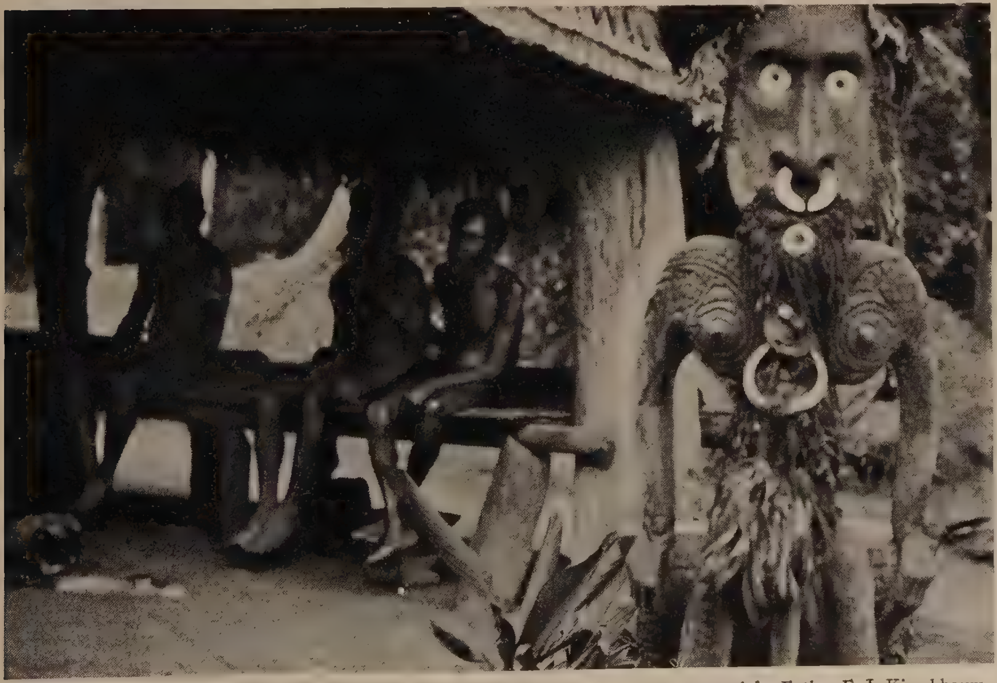
Photographs by Dr. E. W. Brandes

AMBUNTI NATIVES CARVE THESE DRUMS, SHIELDS, AND WEAPONS FROM WOOD

The wooden shields are carried by spearmen and are very heavy and awkward. The two tall cylinders in the center are used for calling crocodiles, supposedly by inserting one end into the water and then suddenly jerking it out, making a gurgling, grunting sound (see page 329).

Photograph by Dr. E. W. Brandes

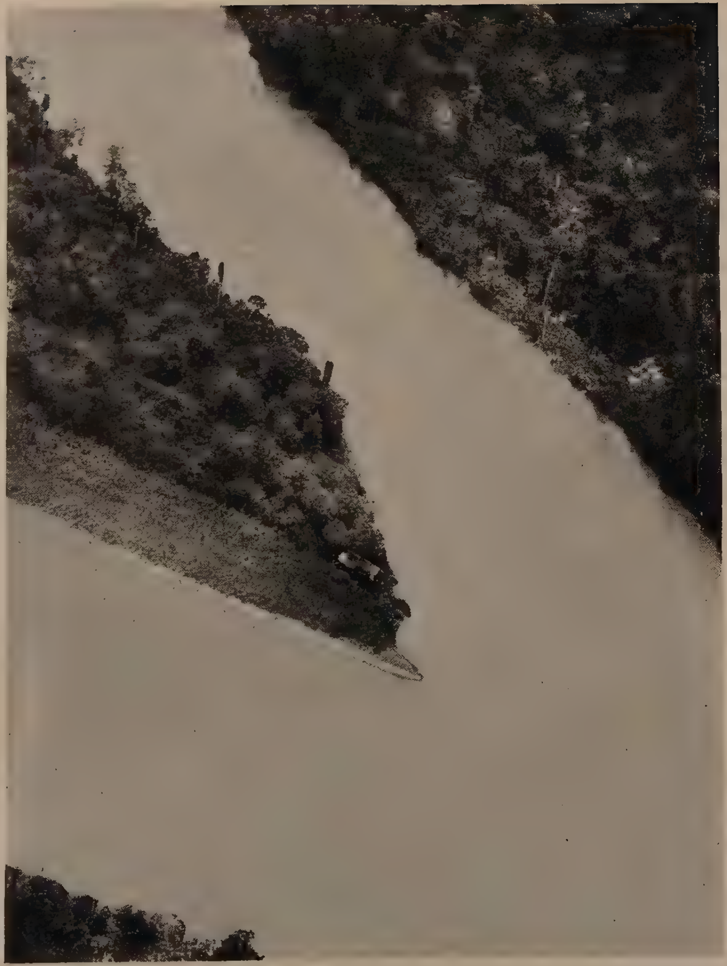
THE SEAPLANE AT THE POLICE STATION IN AMBUNTI



Photograph by Father F. J. Kirschbaum

BESIDE THIS STRANGE FIGURE ORATORS STAND WHEN SPEAKING

When a native of the middle Sepik district wishes to draw especial attention to a certain statement, he adds emphasis to it by pausing to lay a straw on the platform behind this startling effigy.



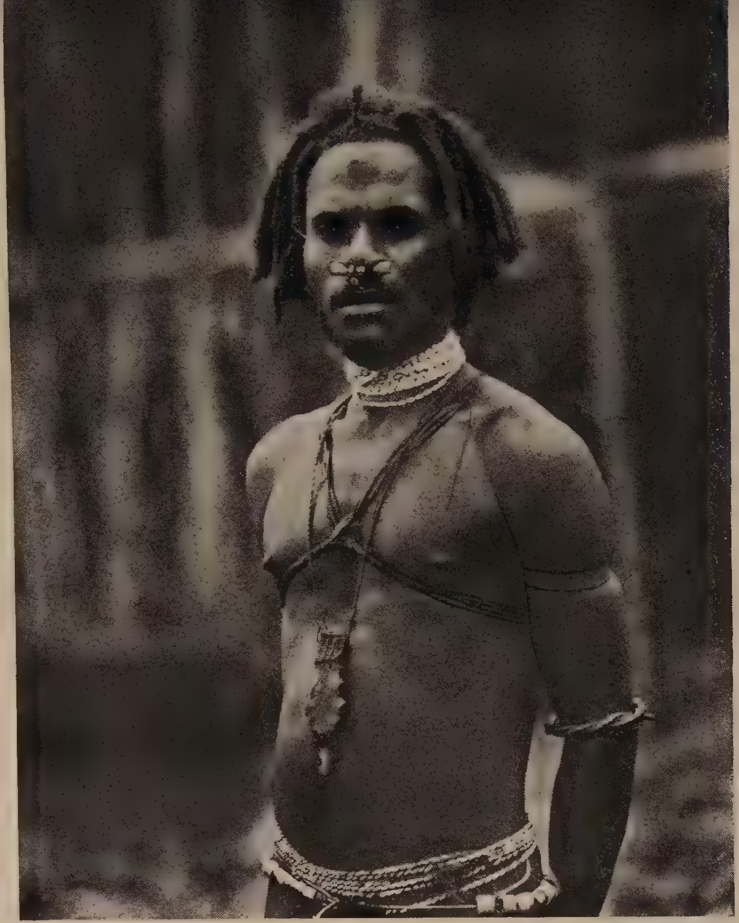
Photographs by Dr. E. W. Brandes

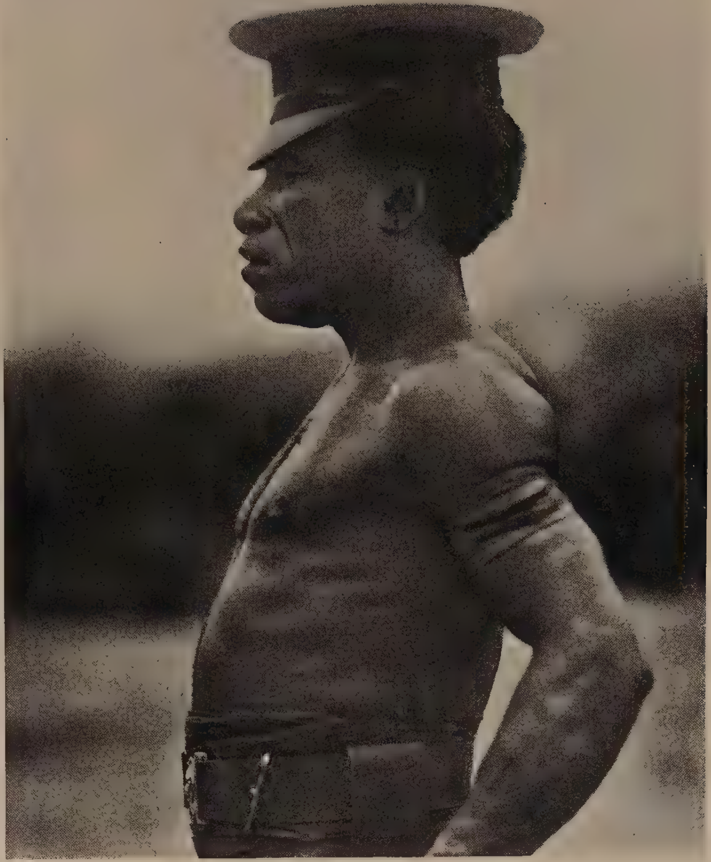
AN ISLAND IN THE UPPER SEPIK, WITH A HOUSE ON ITS POINT

Up this river the American plant hunters explored regions never before penetrated by whites. Signs of human habitation were rare and widely separated.

A STALWART YOUNG WOODSMAN ON THE SEPIK

He belongs to a group of natives who have camped temporarily in the swamps to make sago (see illustration, page 316). His job is to find and fell the sago palms (see, also, text, pages 270-271).





Photographs by Dr. E. W. Brandes

A SAVAGE WHO HELPED TO SAVE THE AIRPLANE

When the airmen descended on the upper Sepik River and were being swept downstream by swift currents, this undaunted native seized a rope thrown to him and aided in preventing disaster (see text, page 323). In his nose he wears a cylinder of bamboo; about his neck is a chain of seeds of Job's-tears. He wears a girdle of the same seed, together with one of human or pig bones. His tight armlet is of woven split rattan.

HE MADE HIS PRISONERS BRING IN THEIR VICTIMS' HEADS!

This is Lance Corporal Bellewi, hero of Ambunti Police Camp, on the Sepik (see page 322). His was an incomparable feat. Aided by only one policeman, he captured 24 jungle savages wanted for murder and marched the whole group four days into camp, compelling each culprit to carry along as evidence the head of a victim. He is a fine type of the civilized native, and has been promoted by the Australian authorities.

Photograph by Dr. E. W. Brandes

THE SEPIK, SEEN FROM ABOVE AMBUNTI, TWISTS AND TURNS THROUGH THE JUNGLE

about 80 or 90 miles from the point we reached on the Ok-Tedi just a month before.

After replacing our starboard exhaust manifold, which had practically fallen to pieces and permitted sheets of flame to lick up along the fabric when idling, with one improvised out of corrugated roofing iron, we started up the river with the Government station, Ambunti, as our objective.

Ambunti is the one other settlement on the Sepik. It also has a white population of three, consisting of a district officer and his assistants. This is the farthest inland police station of either territory, being about 260 miles from the mouth of the river (see pages 317-319).

Flying up the Sepik, we passed over many villages, all recognized by Father Kirschbaum, who had visited them.

Topographically the region is unlike that drained by the Fly. The river passes through a gap in a range in the vicinity of Ambunti. Beyond this, as one goes inland, the country again becomes level and a vast plain spreads in view; but mountains can be seen in every direction at all times.

The next change of significance along the river is afforded by the foothills of the central mountains, succeeded by range upon range of gradually increasing elevation, finally culminating in the majestic splendor of the Victor Emanuel Range. Altogether, it is a far more varied prospect than the prairie of the first 400 miles up the Fly.

The flora, as seen from a mile up, is also different. Instead of the broad ribbon of tall jungle marking the course of the Fly, we saw here small, isolated islands of timber irregularly disposed throughout a sea of grassy plains.

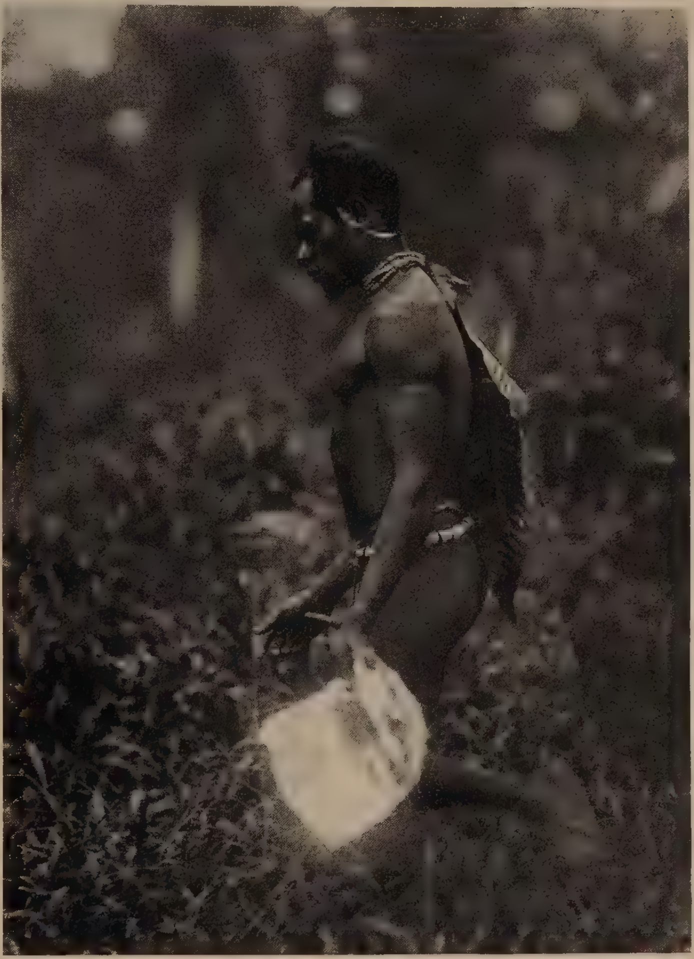
We landed in a beautiful cove at Ambunti and were met by the district officer and his two aides, whose only compensation for their lonely existence must be the unique experience that is theirs.

We pushed on next morning, and in a little more than two and one-half hours were beyond the frontier and over Dutch territory, close to the tall mountains. For the last 100 miles all human habitations were built singly, in small clearings back from the river, or on the tops of the hills at elevations of two to three thousand feet or more.

The river here was narrow and by the force of the current churned to a milk-white fury. We circled into Dutch New Guinea not 20 miles from the source of the Mambaramo, the third great river of this island; then recrossed the border and landed above a house from which natives had been seen fleeing.

A NAKED SAVAGE HELPS TO SAVE THE PLANE

Our experience in mooring was nearly tragic. It was my job to heave out the mud hook; but, with ten fathoms of line out, there was no check to our headlong course down the river. Another ten fathoms were added, making a total of 120 feet, but with similar results. An odd piece of line from the pontoon was hooked on and we came up with a jerk, but began to swing crazily in arcs, from one bank to the other, in a pendulumlike motion.



Photograph by Dr. E. W. Brandes

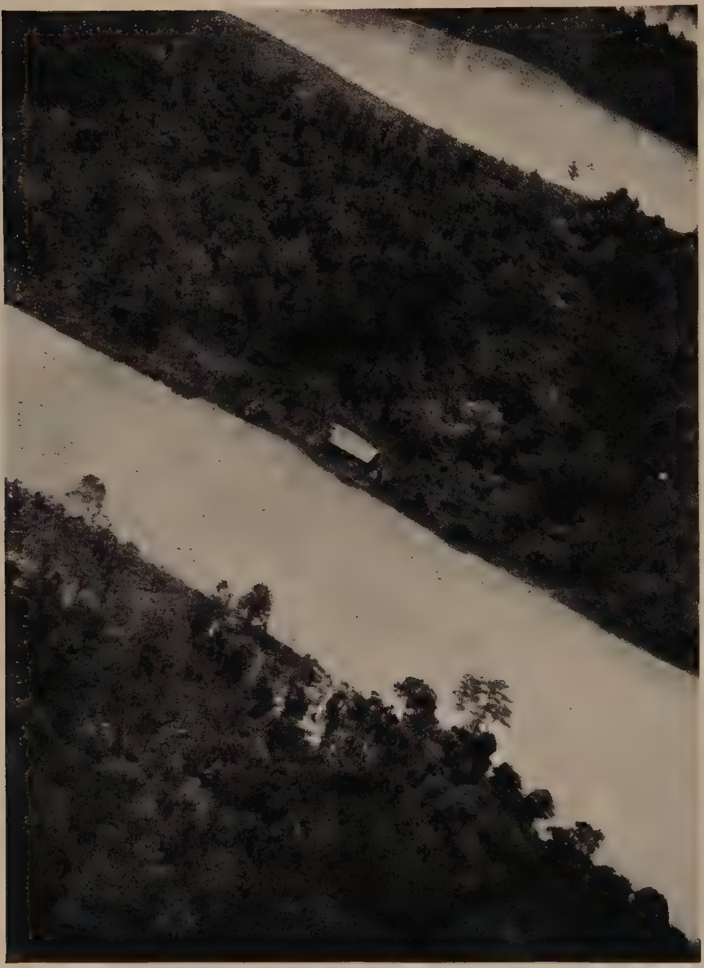
A TINFOIL FILM-PACK WRAPPER IS A GREAT TREASURE TO THIS SEPIK RIVER NATIVE

Each time we approached a bank it seemed that the wing tips, projecting far out, would be crushed against the tree trunks; but each time they missed by a hairbreadth. The strain on the anchor rope made it sing and we expected to see it snap any minute. It was physically impossible to shorten the line paid out, and we lost ground every time we tried it. Likewise it was impracticable to swim ashore with a rope in the fierce current, as the swimmer would have been swept quickly downstream.

Desisting in our efforts momentarily, we saw a naked individual standing right at the water's edge, not more than 100 feet away, regarding us with a ludicrous expression of fear and amazement. I cannot imagine why he had not joined in the headlong flight of his fellows. In our entire experience this was the only wild man who had ever actually stood his ground during our approach (see page 321).

But it was providential for us. When we motioned him to take a rope and secure it to a stump, he actually did so. From the moment we took notice of him, this fellow threw back his head and uninterruptedly trumpeted in a nasal tone of peculiarly full, round but penetrating timbre, extending his arms to us in a supplicating manner all the while.

We discarded the idea that he was more courageous than the others and decided



Photograph by Dr. E. W. Brandes

THREE CONVOLUTIONS OF THE CROOKED UPPER SEPIK APPEAR AS PARALLEL WATERCOURSES

On the jungle-choked river bank, 600 miles upstream from the sea, stands a small village. Here the river is very swift.

that he was merely a mental case, but an extremely useful and accommodating one. We stepped ashore with a bag of trinkets and rewarded him with an assortment of beads and fishhooks. He accepted them without leaving off his peculiar calls, with his almost prehensile lips extended like the bell of a clarinet. The sound carried through the jungle for a great distance; it soon became evident that he was signaling to the deserters, who doubtless were watching from a safe distance.

We indicated by signs that we were thirsty and hungry, and with the aid of a coconut husk showed a preference for that happy combination of meat and drink. This was a lucky gesture, also, and obviously it was viewed by anxious eyes peering at us unseen from the jungle; for soon five or six men came from all directions, bearing a propitiatory offering of coconuts. They placed these on the ground near us and then retired to a safer distance—all but the trumpeter, who now desisted from his musical "Whooooooooo" and regarded us attentively.

We in turn could now observe the natives in some detail.

Most of them were nearly black, but two or three were chocolate-brown and all except two wore full beards. The hair was kinky to wavy and seemed to indicate that the people here are not racially homogeneous.

SEPIK SAVAGES REGISTER EXCITEMENT BY GOURD-RAPPING

The men wore ornaments of pig vertebræ strung like beads, necklaces, and girdles mostly, but also suspended singly or in crossed pairs from the shoulders, so that they resembled the Sam Browne belt or a pair of "galluses." The most distinctive article of personal enhancement was the long, attenuated gourd worn as a sort of apron by the men.

In place of the long-drawn-out whistle with which the middle Fly natives expressed astonishment, these men would rap violently on this gourd with the finger nails by holding the index finger on the ball of the thumb and releasing the muscular tension suddenly, like a small boy shooting marbles. At every fresh evi-

Photograph by Father F. J. Kirschbaum

IN SUCH TRIBAL INITIATION RITES MEN OFTEN DIE UNDER THE KNIFE

Because mortality is so high, the "candidates" are frequently unwilling to submit and must be held. This sanguinary ceremony, photographed on the banks of the Sepik River, does not differ materially from the preparations for a feast on human flesh, in which the victim is dismembered and the various parts of his body are wrapped in banana leaves and cooked in covered pits with heated stones.

dence of the white gods' magic we would be treated to a chorus of raps like the rattling of castanets.

NEW SUGAR CANE WITH GARNET-RED FLESH IS FOUND

Their pipes were long tubes of bamboo. Because of the extreme timidity of these wild creatures, I attempted to gain their further confidence by taking advantage of their taste for tobacco, plants of which were seen in the clearing. After rolling a cigarette and presenting it to a man, much after the fashion of enticing a wild alley cat to come for a bone, I struck a match to the accompaniment of a symphony of gourd rapping. Finally, after he had ducked away several times, I succeeded in lighting it for him. Then his face fairly beamed, and for the next half hour I was pressed into service as official cigarette roller for the entire village. When they inhaled they sucked in the breath so sharply through their teeth that they sounded like a flock of birds singing.

On this trip a wild sugar cane of considerable interest was discovered. The flesh, from rind to center, was a deep garnet-red, and the plants were unusually vigorous, but deficient in sugar.

In one village near Ambunti neither men nor women wore coverings of any description. We did not land there, but later got pictures of some of the men at Ambunti, where they posed for us. They are of an extremely bestial type.

On the other hand, the material culture of some of the Sepik natives is of a high order. Despite this, they are cruel, bloodthirsty savages under the skin, and a short time before our arrival a group from one village raided another and secured 23 heads as trophies.

We landed at a number of these middle Sepik villages, some on the river and others on small marshy lagoons or lakes. A fair proportion of the natives of this region had seen white men before, as labor

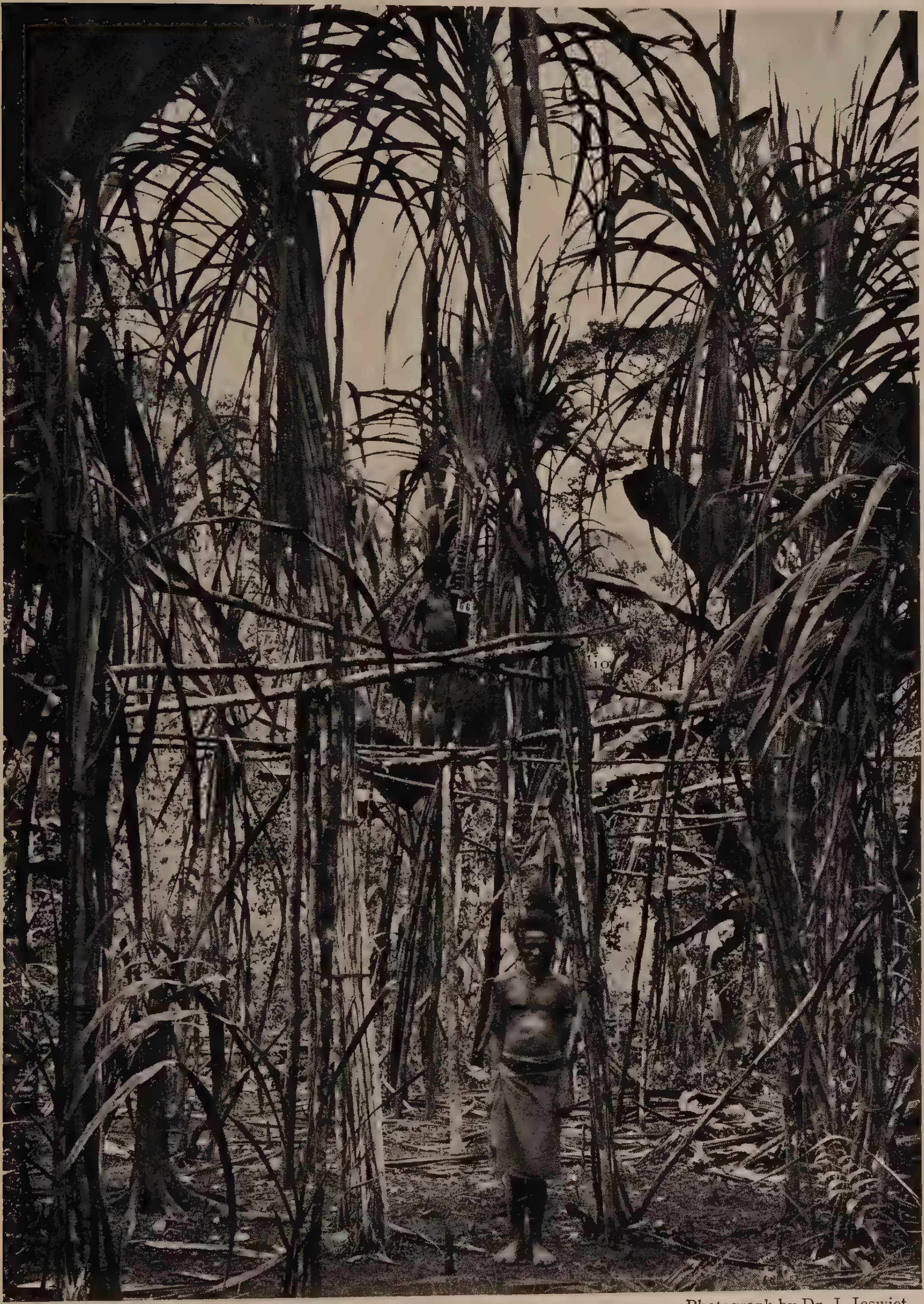
BROTHER JOACHIM (LEFT) WAS A BUTCHER BEFORE HE BECAME A MISSIONARY

At the right stands Pilot Peck. It was Brother Joachim who resumed his earlier calling to make cassowary sausage for the members of the Expedition (see below).

Photographs by Dr. E. W. Brandes

FIVE NATIVES DISPLAY A CASSOWARY

This giant fowl, from whose claws arrow heads are made (see illustration, page 295), was shot in the jungle behind the Marienberg mission house, 60 miles above the mouth of the Sepik River. From the flesh Brother Joachim (see above) made a supply of link sausages, the only food the Americans had during several flights.



Photograph by Dr. J. Jeswiet

A SUGAR-CANE GARDEN IN THE VILLAGE OF BARATAKA

For protection during growth, preparatory to cutting and shipment, the cane stalks are tied to long poles set in the ground beside each hill. Boys climb up to horizontal connecting poles to clean the cane and keep it tied to the uprights. Note the identifying serial number of one of the 130 varieties of cane brought back to America. Barataka is a mountain village inland from Rigo.

Photograph by R. K. Peck

MAKING CANE JOINTS READY FOR THEIR LONG VOYAGE TO AMERICA

Of course the Expedition had to be on its guard against any harmful insects that might stow away on cane specimens. Here Mr. Pemberton is seen trailing a dangerous parasite, while Dr. Jeswiet and his "boy" look on.

Photograph by Dr. J. Jeswiet

SUGAR-CANE CUTTINGS HAD TO BE CAREFULLY PREPARED FOR SHIPMENT

Adventuring by seaplane, canoe, or on foot into jungles in quest of cane was not the only serious task. Infinite pains were taken in packing to keep cane joints alive.

recruiters occasionally go up the river as far as the Government station, and of course the three Government officers and Father Kirschbaum circulate among them to some extent. It should be remembered, however, that the region in which they operate is about the size of the State of Pennsylvania and is bordered on the south by a great unexplored area, the one we had just glimpsed from the air. Consequently we were looked upon even here as objects of great curiosity.

A description of one middle Sepik village will suffice for all.

NATIVE CLUBHOUSES 50 FEET HIGH AND 150 FEET LONG

The natives of Jaurangei, which is built on a long, crescent-shaped lagoon, 30 minutes by air downstream from Ambunti, had seen the airplane as it passed high over their well-concealed retreat on its way to the vast, silent interior; so they were not entirely unprepared when it reappeared and descended from the sky to the placid water of the lagoon.

As we taxied toward the bank a large crowd of naked black men, with here and there a striking, ghastly specimen painted chalk-white from crown to heels with pipe clay, assembled on the beach to receive us.

The main feature of the village is a series of three great structures, spaced about 500 feet apart, in a straight line through its center. These are the house *tambarans,* or clubhouses, of the men of the different clans comprising the village. Unlike the dubu houses of the Fly or the ravis of the Papuan Delta country (see text, pages 269 and 275), they are not dormitories, but are for ceremonial and other meetings, and are used also as repositories for sacred objects.

These buildings are about 50 feet high and 150 feet long, made of thatched palm sides and roof on a framework of more or less artistically carved logs of enormous size and length. The posts that support the roof at either end are carved like totem poles, to represent men and beasts, from base to peak, terminating 50 to 60 feet above the ground in a carved hornbill posed for flight. This portion projects six or eight feet above the ridgepole, which is lashed to the post.

Invariably the lowest figure represents a nude woman, the buttressed roots of the tree from which the post was taken nicely adapting themselves to represent her extended lower limbs. These carvings are not at all crude, but indicate a fine perception of anatomical detail on the part of the artists.

The earth floor of the tambaran is compacted by the tramping of countless feet, so that it is almost as hard as cement. Here are stored the drums, made of hollowed logs 8 to 12 feet long and 3 feet in diameter. A slot 6 inches wide extends nearly to the ends of the log, and from this narrow aperture the woody interior has been laboriously chipped out, leaving a hollow, resonant shell.

The ends of these great drums are artistically carved in the form of birds, reptiles, or men. To sound the drum, a heavy pestle-shaped club is inserted in the slot and the anointed priest of the drum moves up and down its entire length, as he rattles it against the lips of the slot, producing a deep-throated percussion that carries for a prodigious distance in the stillness of the night.

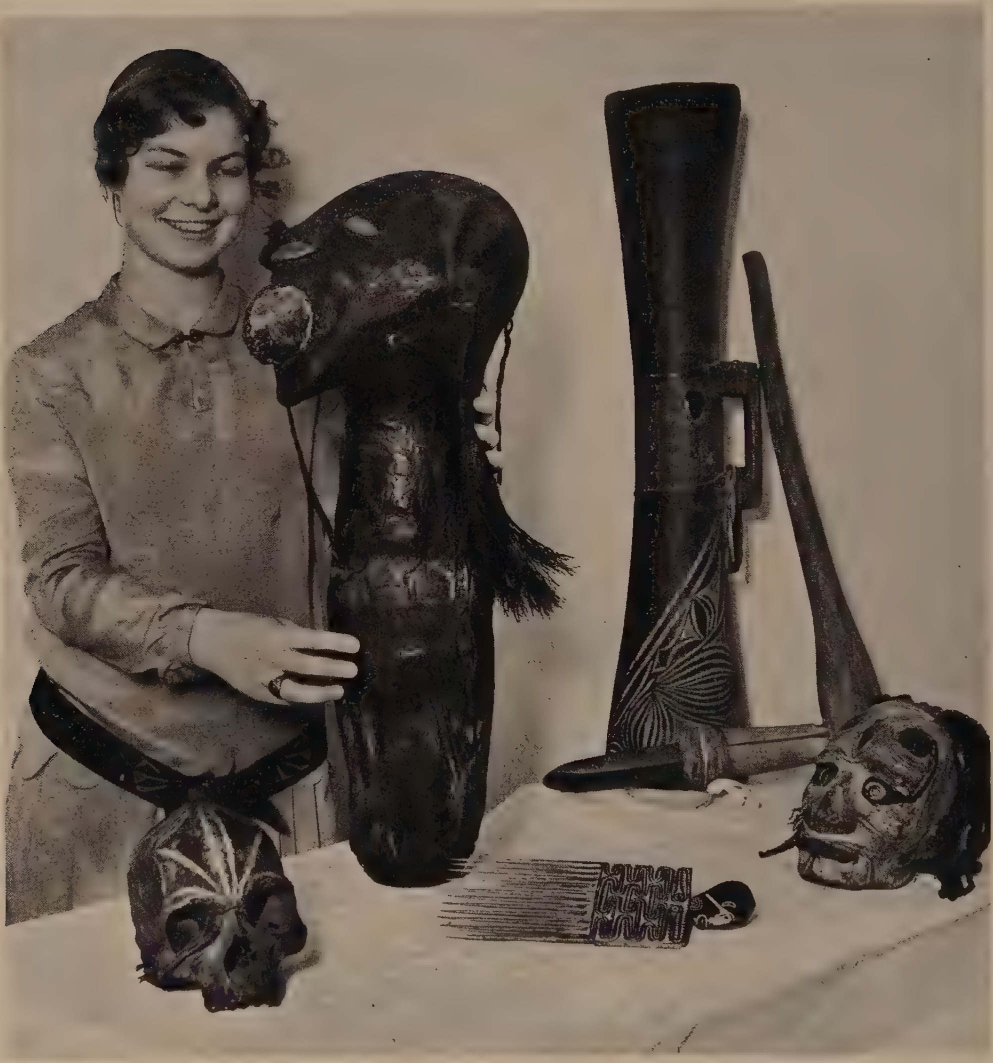
When eight or ten of their drums are sounded in unison, the noise is deafening.

DRUMS, SHIELDS, AND HEADRESTS ARE ELABORATELY CARVED

A richly carved tube, constricted at the middle and roughly resembling the spindle-shaped drums, but much longer, was observed, and its peculiar use is worth recording. It was explained that these instruments are thrust into the water of the river, and upon being suddenly withdrawn they make a sound resembling that of a crocodile's call and presumably attract these reptiles to the hunters.

Immensely heavy wooden shields for spearmen, headrests for sleeping, and stools, all wonderfully carved, were seen in abundance. Suspended from the ceiling were carved wooden figures of nude men and women with clusters of wooden hooks at their feet, on which were hung miscellaneous articles of value. These figures are representations of spirits who guard the valuable objects from defiling hands.

The gable ends of the buildings were pierced with small openings, geometrically arranged and having wooden spikes



Photograph by Edwin L. Wisherd

GRUESOME ACHIEVEMENTS IN BARBARISM FROM NEW GUINEA

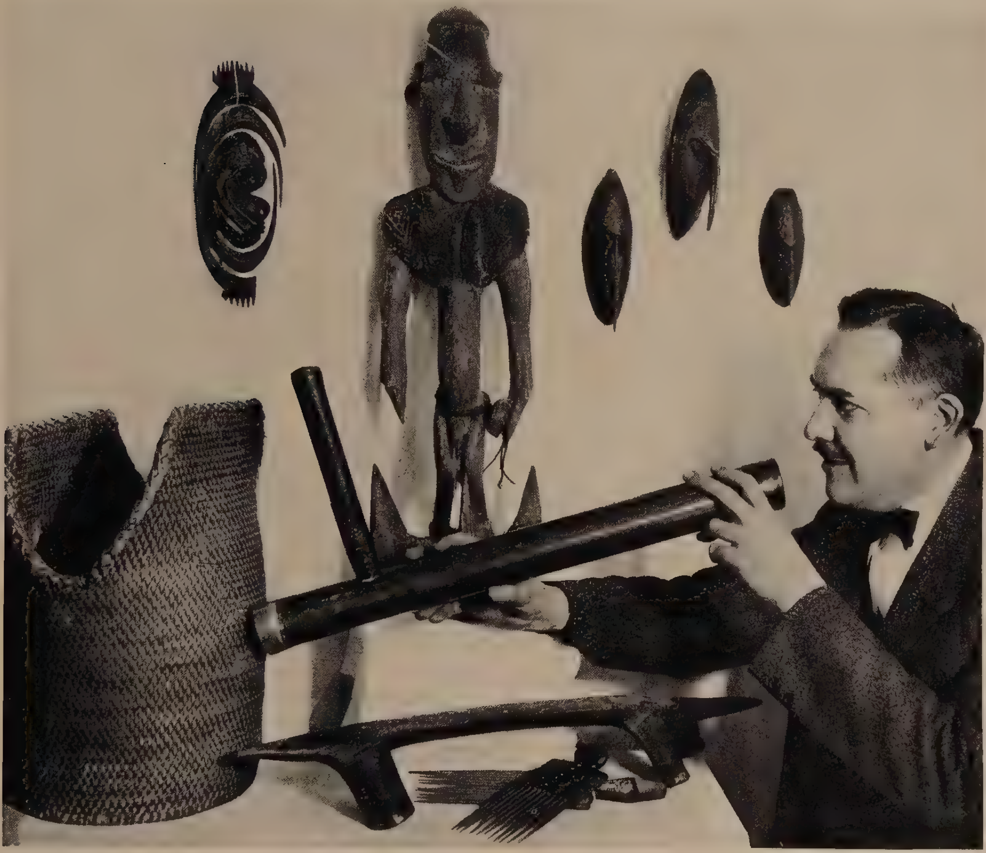
Left to right: A sculptured skull from the Strickland River country; stuffed human head from the region of Lake Murray (see text, page 295); ornamental wooden comb carved by Wussi River natives; carved wooden drum from the Ok-Tedi country; stone ax from the Fly River region; the skull of a raid victim with built-up face of painted clay, from the Sepik River (see text below).

projecting upward from the lower sills. On each spike was a grinning human skull, facing outward—a warning perhaps.

WOODEN TUBES USED AS "MOSQUITO NETS"

Of outstanding significance is the practice here of building up with clay the faces of enemies, and perhaps deceased relatives as well, on the original skulls. These curious objects are provided with cowrie shells for eyes and the natural hair is replaced. When the finished article is painted it is strikingly realistic (see above).

The most interesting single item in the dwelling is the infernal contrivance used as a protection against mosquitoes. As a rule, two or more of these "sleeping bags" are found in each house, one for each family under the same roof. They are simple tubes, closed at one end, made of



Photograph by Charles Martin

THE AUTHOR EXAMINES A CIGARETTE HOLDER "MADE IN NEW GUINEA"

These artifacts reveal the nature and degree of tribal culture in widely separated regions of the island. At the left is a cuirass of woven rattan made by the Ok-Tedi jungle pygmies; the cigarette holder is from Lake Murray. Below is a wooden neck rest or pillow from the Oriomo River. In the left background is a silhouette woodcarving from a tributary of the Sepik River, and at the right are long-nosed wooden masks representing spirits of the departed, Sepik River. In the center is a figurine with hooks for feet. Objects hung on these hooks are inviolable and may not be removed by anyone except the owner. In his observations of native customs and handicraft, the author received invaluable assistance from Mr. F. E. Williams, Government anthropologist for the Territory of Papua.

tightly woven matting and supported by hoops of split bamboo, spaced about three feet apart, on the inside, throughout their length. The average size is 10 feet long and 3 feet in diameter. There is no supporting hoop at the open end and it is merely collapsed on the floor at this point.

The householder, with his numerous wives and children, enters this almost airtight torture chamber on his hands and knees and swelters in the foul air in preference to being devoured by mosquitoes.

We caused a great commotion in one of these peaceful dwellings by taking motion pictures of routine activities of the inmates by the aid of sputtering calcium flares.

Again back at Marienberg mission, we prepared our valuable collection of plants for the return journey to Port Moresby. On the day of our return the "shooting boy" brought in a fine cassowary. This giant bird has a leg as large at the thigh as that of a man. A second cassowary, bagged the following day, was made into sausages, our food on the return flight to Port Moresby (see page 326).

Game abounds here. The cumbersome

hornbill thrashing through the air in noisy flight, the goura pigeon, large as a young turkey, and even crocodile eggs made up part of our menu. I managed to eat the crocodile eggs, but candor compels me to state a preference for the barnyard variety, served with ham in the United States.

It is amusing to add that the shooting boy had climbed to the roof of the cookhouse to get a better view of us when we made our first appearance at the mission. As we circled overhead he slid from the roof and rushed to the missionary, shouting, "Master, master, the Savior he come!"

OVER BLUP BLUP, A VOLCANIC ISLAND

Back now from exploring that dark Sepik River region of sorcery and cannibalism, our cane collection achieved, we turned our sunburnt faces homeward.

On the morning of August 3 we flew along the north coast to Samarai, a distance of about 950 miles, arriving in the late afternoon. On this trip we passed a strange volcanic island, which rises from the sea between the mouths of the Sepik and Ramu rivers. It is known to natives by the onomatopoetic name of "Blup Blup." It was erupting at the time and showed evidence of two recent lava flows on the landward side.

From Samarai we took off early next morning for Port Moresby. Clouds had not yet mantled the interior mountains. So, to our astonishment, we could now see that a month before, on our blind flight across the island, we had actually hopped over the highest point of the whole central range of mountains! Without suspecting it, we had missed the peaks by only a few hundred feet!

At Port Moresby our final collections of cane were prepared for shipment, and soon we were aboard a convenient tramp on our way to Sydney. As many of the cane cuttings had started to sprout, we had to improvise a garden on deck. At Sydney, also, as a precaution against loss, a complete duplicate set of our collection was planted in quarantine, in fields provided by the Colonial Sugar Refining Company.

From Sydney we brought our cane to Vancouver, and thence by rail to Washington. At Vancouver, also, our plane was put on wheels and flown over the Rocky Mountains, arriving at our starting point, Washington, D. C., just 200 days after our departure. Incidentally, I later used that same plane for making aërial pictures of Lake Okeechobee and the Everglades in Florida.

NEW GUINEA CANES NOW FLOURISHING IN WASHINGTON, D. C.

In quarantine greenhouses at Arlington Farm, across the Potomac from Washington, we planted our cane collection. A fair proportion of the varieties which survived the trip are now vigorous young plants. Those which failed to survive the long trip are being replaced from our intermediate depot of duplicate plants propagated at Sydney.

About 130 distinct varieties of sugar cane, selected with a view to disease-resistance and adaptability to conditions in the Gulf States, resulted from this expedition. It remains now to test these plants under the conditions of commercial cane culture in the South. Superior varieties will eventually be developed by a series of carefully controlled tests and distributed to sugar planters.

It is conceivable that some of these varieties, propagated on a commercial scale, will eventually reach proportions gigantic in comparison with the limited amounts found in their native habitat. Thus we see that races of plants, like races of people, may migrate from one far part of the world to another to multiply and replenish the earth.

Notice of change of address of your NATIONAL GEOGRAPHIC MAGAZINE *should be received in the office of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your November number, the Society should be notified of your new address not later than October first.*

THROUGH JAVA IN PURSUIT OF COLOR

By W. Robert Moore

"A CUP of Java and a couple of buns" was one of the first morning calls that I answered behind a restaurant counter on an odd-job venture in my early school days. But for the man who associates Java with a cup of good coffee alone, a visit to that Garden Isle is a delightful revelation.

Marching the length of Java in search of interesting subjects for my color camera, I found a long panorama of fascinating attractions. There were innumerable wide fields of waving sugar cane, with busy refineries in their midst, and everywhere rice fields were checkerboarding the valleys or stair-stepping in terraces up the volcanic hillsides. Into the market places came huge piles of cassava roots, from which evolve our tapioca puddings, and beyond the roads were cinchona plantations, destined to produce quinine to combat the world's malarial fevers.

It was a fast-moving procession of ancient Hindu temples, quiescent and erupting volcanoes, batik workers, *wayang* dancers, and *gamelan* orchestras; of olive-skinned Javanese in bright sarongs laughing on their way to market, plantations of rubber and coffee, and large hill areas, where Dutch planters were reading fortunes in cups of pekoe tea, but with far more accuracy than ever did my aged grandmother.

THE START FROM SINGAPORE

But to begin: It was a starlit night, soft and caressing from a breeze after a tropical shower, when our ship lay at anchor in the open roadstead at Singapore harbor. Between us and the sparkling lights of the city rode ships from the far ports of the world, sailing under a score of different flags. Among them were brightly lighted steamers from London, bound for Sydney or Shanghai; from New York girdling the globe; from Kobe, Amsterdam, and Naples; and close ashore were hundreds of bobbing Chinese sampans and high-pooped junks lighted with smoky coconut-oil lamps.

Our anchor chains rattled, and with the steady throb of the engines we swung toward the Southern Cross and cleared for Batavia, leaving behind the cosmopolitan city of Raffles's dreams.*

Across the Equator we traveled into the Southern Hemisphere, and, after 40 hours of cleaving the smooth, turquoise sea, our ship tied up alongside the wharf at the up-to-date Tandjoeng Priok harbor, 20 minutes by motor car or electric tram from Batavia.

MOSQUITOES ARE RESPONSIBLE FOR BATAVIA'S MODERN SUBURB

Docking late in the day, in a heavy downpour of rain, we asked the captain if we might spend the night aboard instead of going to a hotel, as we had to be at the harbor again early the next morning to transship our goods.

"We make no provision for people while in port," explained the captain. "It's pretty noisy, the diet is simple, and sometimes the mosquitoes bother a little," he added. "However, if you fellows are willing to put up with the fare and promise not to write anything about the mosquitoes, you may stay on the ship. Keep your cabin door closed, and if you don't turn on the lights you'll be all right."

Of the onslaughts of the mos—— (my silence is pledged). But mosquitoes, together with the swampy flats of that region, have loomed large in Batavia's history and they have built for her a new city.

Time was, in the early period of colonial development, when the Dutch came out to Batavia they brought their love of the lowlands with them, and there built closed houses on the canals, which ran through the low, swampy land. But, as trading men and soldiers died by thousands from malaria and other diseases induced or aggravated by the miasmic vapors which surrounded them, they eventually learned that tropical Java was not a temperate Netherlands.

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* See "Singapore, Crossroads of the East," by Frederick Simpich, in the NATIONAL GEOGRAPHIC MAGAZINE for March, 1926.

When Capt. James Cook started homeward, in 1770, from his strange adventures of exploration and discovery in the South Pacific, he put in at Batavia to repair his weathered ship *Endeavour,* and there it was that poor Tupia, his little Tahitian friend and interpreter, "died of fever, caught from the deadly climate and uncleanliness of the place." *

Batavians have since moved their residences to the near-by suburb of Weltevreden, meaning "well content," which enjoys a far more healthful climate and has beautiful, wide avenues, the broad Koningsplein, and other well-tended parks. Most of the business offices and godowns still remain in old Batavia, although branch offices and new buildings are, more and more, being located in Weltevreden.

THE TWO-WHEELED "SADOS" ARE FEATURES OF BATAVIA'S TRAFFIC

Existing alongside the fine, large stone and stucco offices and bank buildings in the old city, one can also see the cluttered quarters of the Chinese population. Motor cars, many of which come from a large American assembling plant located in the city, whirl along the excellent streets, and a clanging steam tram closely resembling George Stephenson's historic *Rocket* connects the two sections of the city. *Sados* (or *dos-à-dos*), those little two-wheeled carts where one sits chummily back-to-back with the driver, are still a popular means of conveyance.

In spite of the fact that Batavia carries on a heavy world trade, most of its business comes to a drowsy standstill for a long siesta during the heat of the day.

Leaving Batavia, we shipped for Soerabaja, along the northern coast of the island, dropping in at Semarang on the way long enough to load a dozen lighters of freight and exchange a few passengers. Although Semarang proudly asserts that it is the third city in Java, Batavia and Soerabaja each greatly outdistance it in population and shipping figures. The business district is the usual odd mixture of buildings common to Eastern ports, but the color of the market day in the native *passar* lured me beyond sane reason to try many snapshots of the comely, olive-cheeked maidens and wrinkled matrons. The results, however, were largely hopeless blurs, as the women dodged about in their stalls of vegetables or hid their faces from my camera lens.

At the approach to Soerabaja, in the bright sunlight of early morning, we saw the beautiful smoky-blue masses of the Tengger Mountains, with the volcanic cones of Ardjoeno and active, mist-capped Semeroe notching the sky to the south. The ship crept up the river mouth past the huge dry docks and the expanding harbor works to the wharf. With the exception of Singapore, Soerabaja can accommodate ships for repair better than any other place in the East Indies.

But big, modern Soerabaja, with its up-to-date automobile salesrooms, radio shops, department stores, and palatial residences along its shady boulevards, is a poor place for a person seeking camera studies of native Java. So we sat in a hotel one afternoon, where Dutch people lounged about the verandas clad in gay, starched pajamas and flowery kimonos, discussing whether or not our itinerary should include Tosari hill station and the erupting Bromo Volcano.

"I've never been there, but I doubt if it's worth it. Anyway, it's uncertain weather," volunteered an American business man.

"But it is recommended by the tourist bureau," I said.

"Yes; so did an overenthusiastic Dutchman once walk me for a whole morning to see a waterfall not ten feet in height," he complained.

UP TO CLOUD-ENGULFED TOSARI

Yet we went. An hour on the morning express to Pasoeroean and 24 miles by motor road, which zigzagged in dizzy hairpin curves up the steep 6,000-foot mountain side, through tall casuarina woods, and we reached cloud-engulfed Tosari.

When the fog turned to rain, as the afternoon wore on, and I shivered all through the long dinner hour in spite of my top coat, I went to bed under all of the blankets I could find and heartily agreed with the American in Soerabaja—

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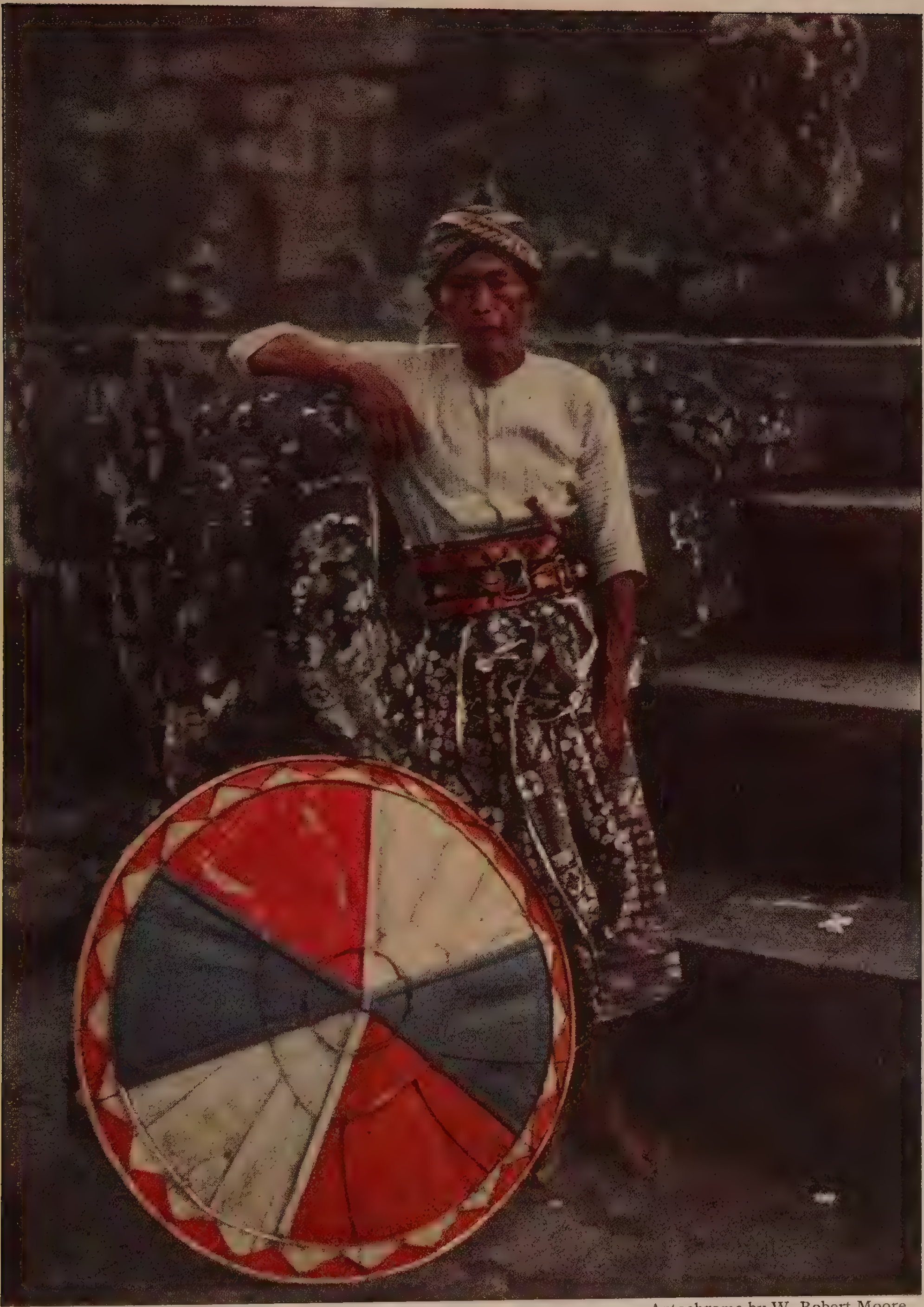
* See, also, "The Columbus of the Pacific," by J. R. Hildebrand, in the NATIONAL GEOGRAPHIC MAGAZINE for January, 1927.



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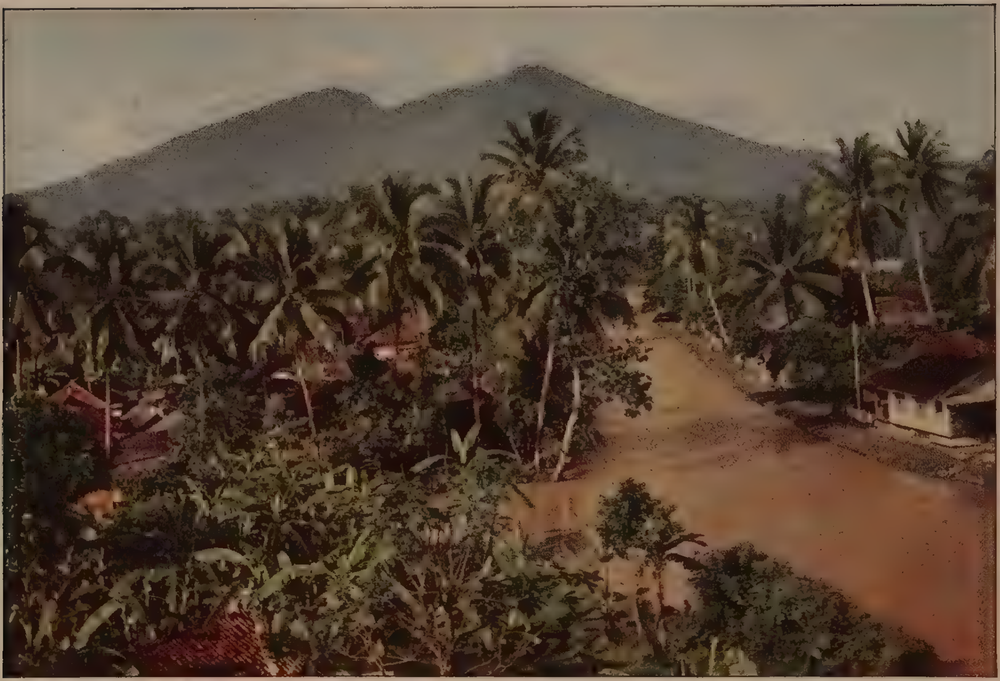
Autochrome by W. Robert Moore

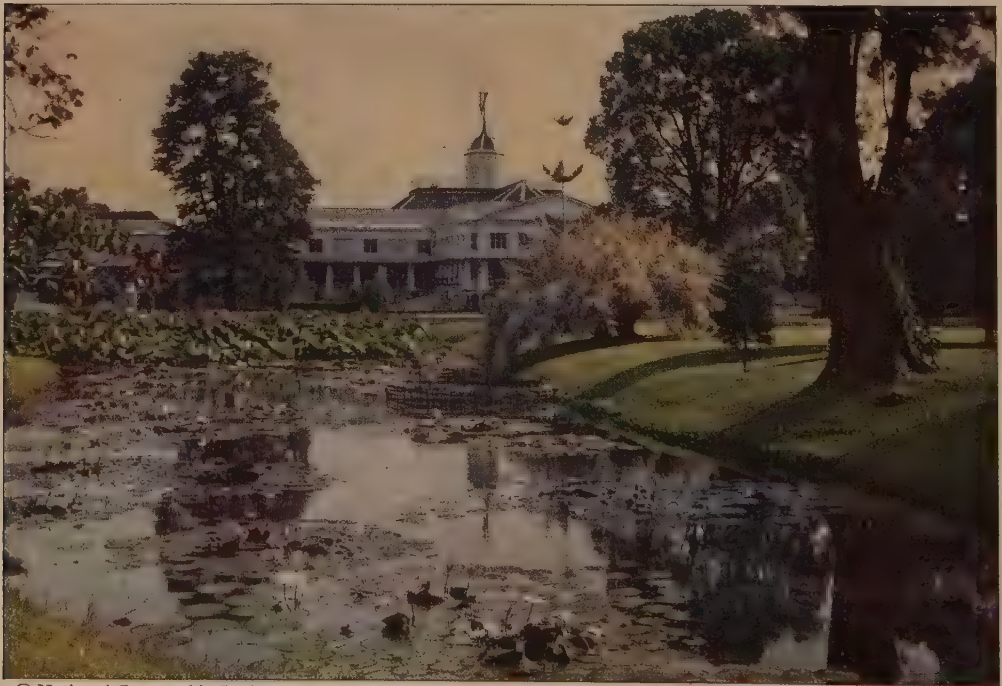
A VENERABLE GUARDIAN OF THE SACRED TEMPLE OF A THOUSAND BUDDHAS

Many centuries ago, before the Mohammedan conquest, Boroboedoer's magnificent monument was raised. As a structural achievement it rivals the Great Pyramid and its sculptures record the artistic and cultural development of Java's golden age. The timeworn gentleman with "sunshade" hat at his feet guards the precious ruin against desecrations of vandals and souvenir hunters.



CLOUD-CAPPED SALAK LOOMS ABOVE A SEA OF VERDURE

An excellent climate has made Buitenzorg the island's country capital, where the Governor General, and such other officials as can, seek surcease from the heat of Batavia. Coconut palms border the muddy river which flows through the city, and on the near-by slopes of Mount Salak, tea and coffee plantations flourish.



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A LOTUS POND ADJOINS THE GOVERNOR GENERAL'S PALACE

Queen Wilhelmina's representative in the East Indies governs more than 50,000,000 subjects. His magnificent residence at Buitenzorg is in the midst of a botanical garden which Dutch horticultural genius, a tropical sun, fertile soil and a daily shower have combined to make one of the finest in the world.

PLAYING NURSEMAID TO A FIELD OF YOUNG RICE

Modern methods have made little impression on the Javanese rice farmers, who still cling to their age-old methods. The seed is sown in well-watered nursery beds, and after the plants have obtained a start they are gathered in small bunches and transplanted to larger fields, where they are set out about a foot apart.

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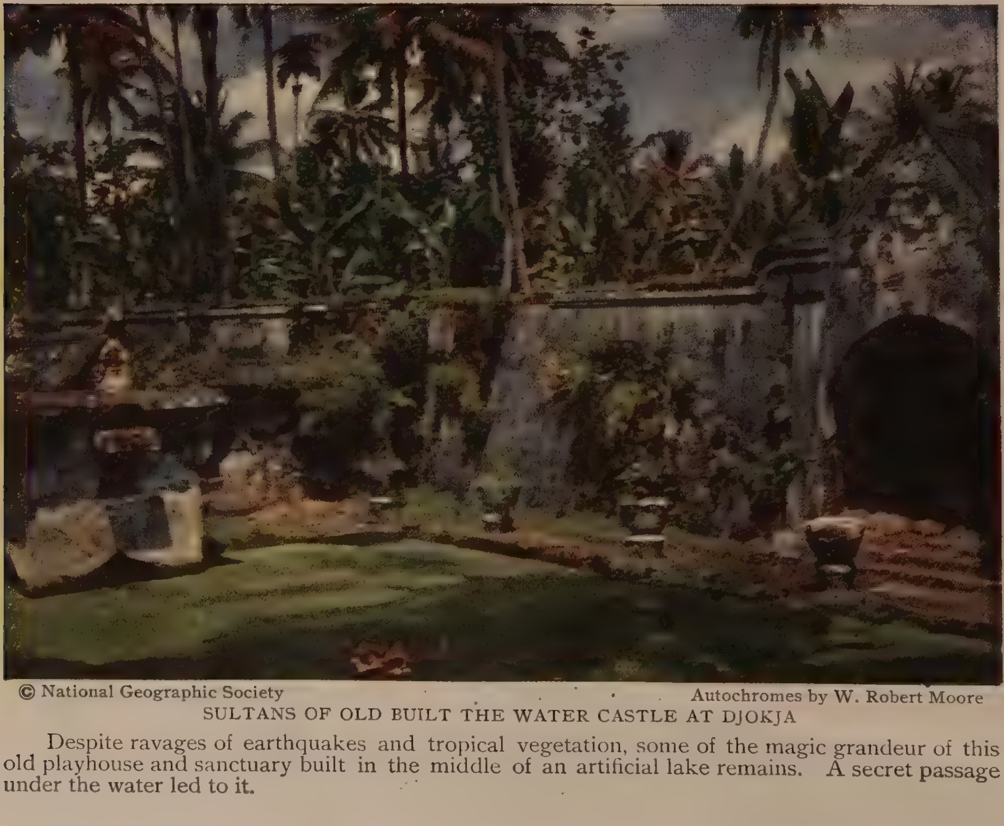
ZEBU CATTLE AND A COVERED WAGON CARRY SUGAR CANE TO THE MILLS

Java is one of the world's chief producers and exporters of sugar and the cane has been grown there for centuries. The driver of this equipage, regarding the camera as possessed of an "evil eye," stubbornly refused to be photographed and hid himself far back in the cart. At the left is a field of growing cane.

FISH MAY ALMOST BE RECKONED A FARM CROP IN PARTS OF JAVA

Along the north coast there are miles of artificial fishponds, and many a house has one in the back yard. Several varieties of carp are raised, including large goldfish which are prized both for their appearance and for their flavor. The Government encourages this back-yard fish industry.



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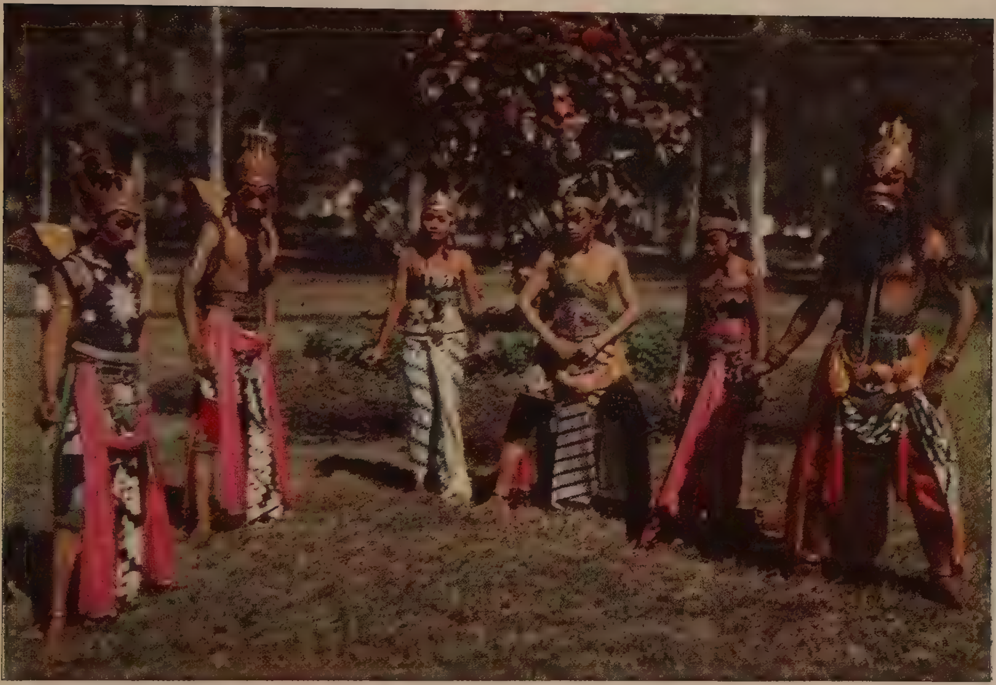
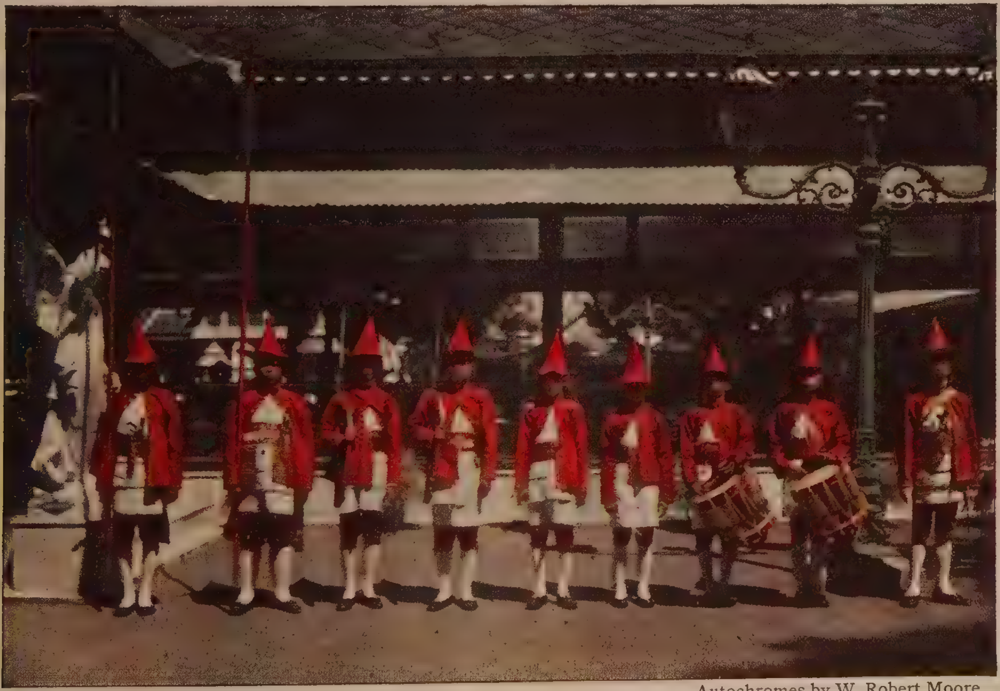
SULTANS OF OLD BUILT THE WATER CASTLE AT DJOKJA

Despite ravages of earthquakes and tropical vegetation, some of the magic grandeur of this old playhouse and sanctuary built in the middle of an artificial lake remains. A secret passage under the water led to it.



WAYANG PLAYERS ENACT MYTHS AND LEGENDS OF THE LONG AGO

While motion pictures are popular in Java, they do not command the same degree of interest displayed in the native drama, or *wayang*. The actors at the extreme left and right represent, respectively, the Sun God and the King of the Devils (see also Color Plates VI and VII).



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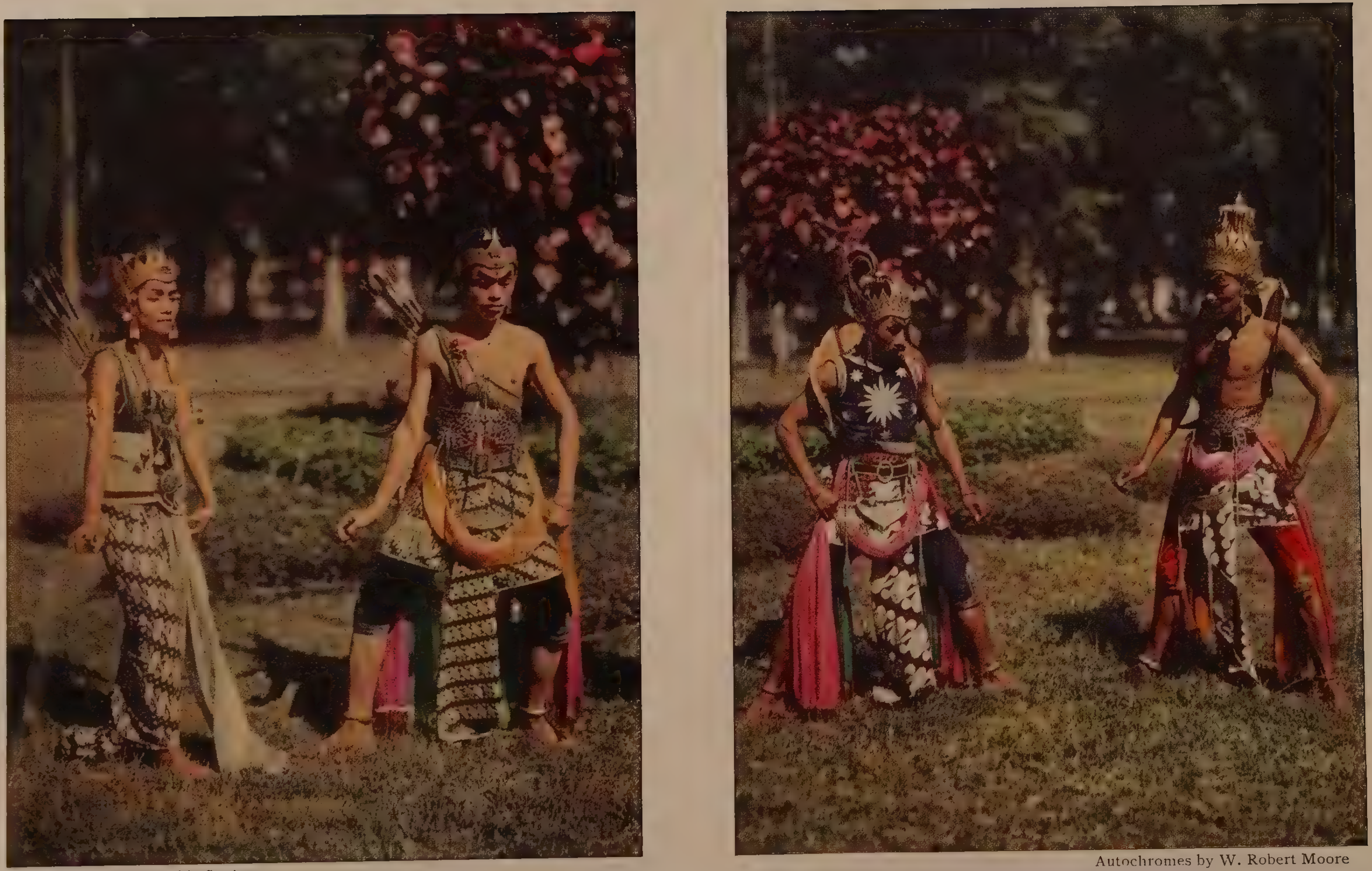
THE HIGH HAT BODYGUARD OF A NATIVE DIGNITARY

A few princes still maintain the outward show and trappings of their ancestors' estate, surrounded by numerous retainers who live within their palace inclosures, or *kratons*. At Djokja the Sultan's kraton is a mile square.



Autochromes by W. Robert Moore

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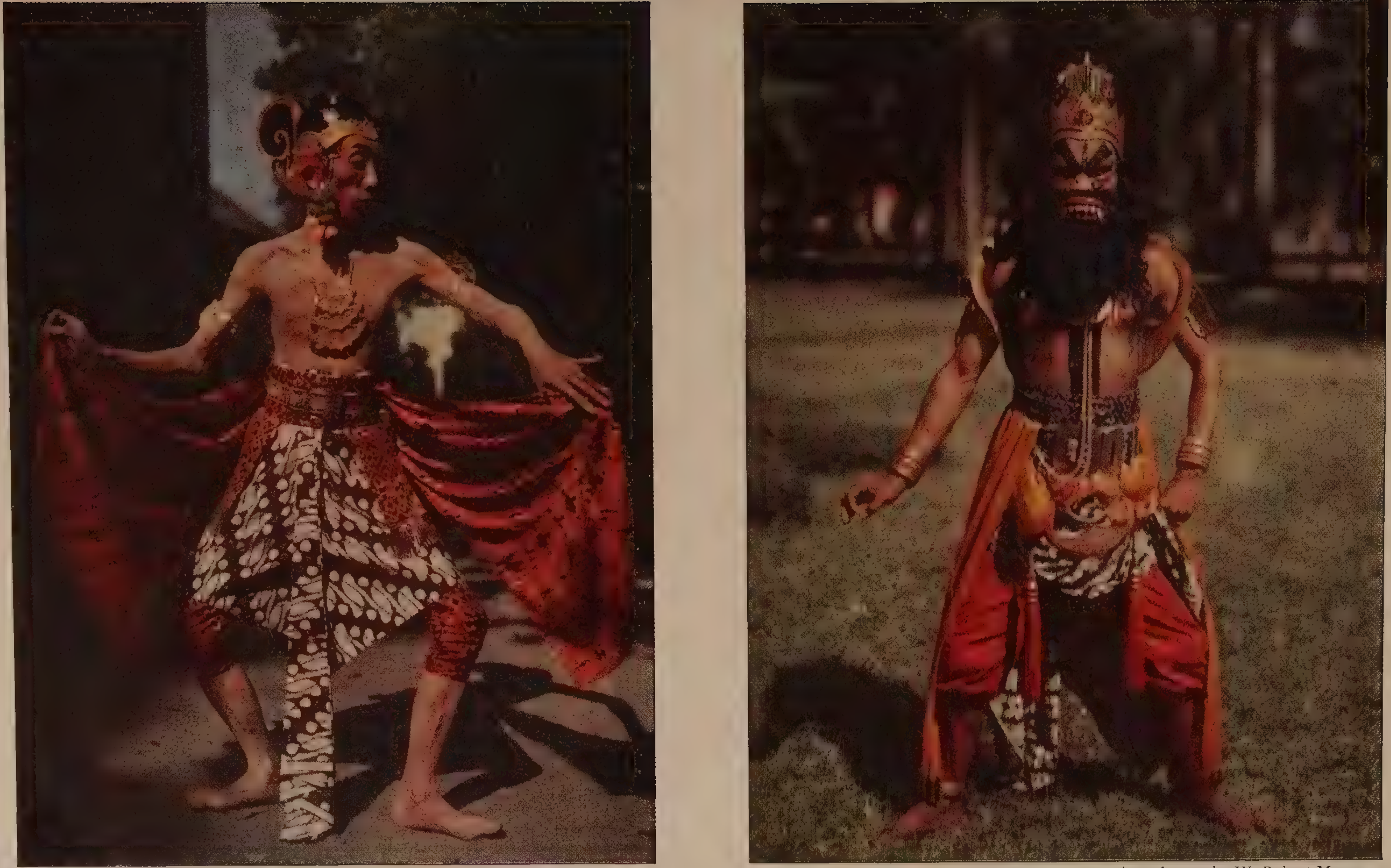
ONE MUST BE WELL VERSED IN NATIVE FOLKLORE TO UNDERSTAND THE ACTIONS OF WAYANG PERFORMERS

The plays are of two kinds, the *wayang purwa*, performed with puppets and dating back to pre-Hindu days, and the *wayang orang*, a comparatively recent development in which human actors perform. The puppet shows had their origin in a sort of shadow play connected with an ancient native ancestor worship. The shadows on the screen represented the spirits of the departed, and the plays were built up around their great and noble deeds.



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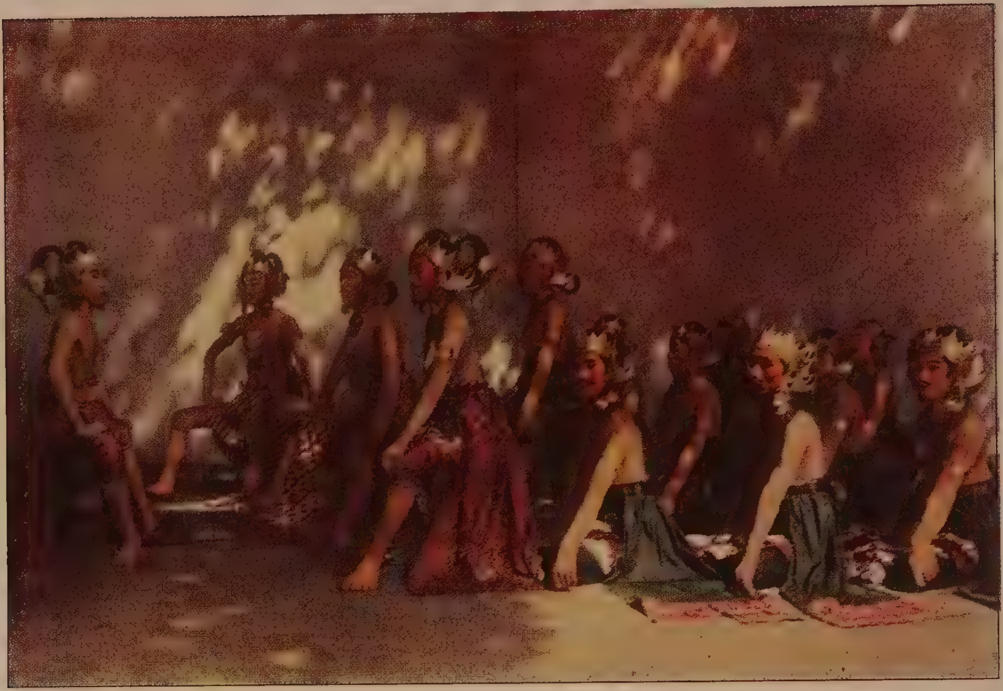
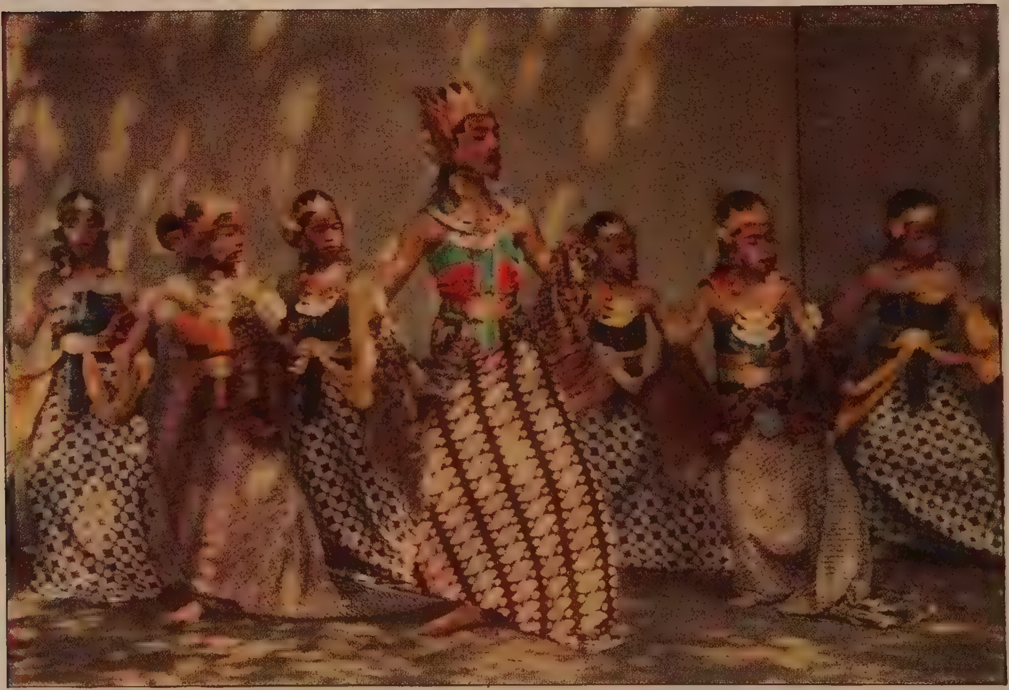
Autochrome by W. Robert Moore

JAVANESE STAGE CONCEPTIONS OF A LEGENDARY PRINCE AND THE KING OF THE DEVILS

Although not quite as popular as the puppet shows, wayang orang performances are well patronized. The actors travel about in troupes and the myths and legends they enact prove so interesting to their audiences that it is not uncommon for a single performance to last for several nights. Frequently the presentations are pantomimes and a reader accompanies the action with appropriate explanatory remarks (see also Color Plates V and VI).



A NATIVE SULTAN'S PRIVATE WAYANG TROUPE



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BOY IMPERSONATORS TREAD THE SLOW, RHYTHMIC MEASURES OF A NATIVE DANCE

To the speed-loving West, their leisurely movements would probably seem a veritable slow motion picture. However, each posture assumed has a significance of its own and conveys a meaning to the interested Javanese onlooker. The seven boys are performers at the Court of Djokja.

Tosari weather certainly wasn't exactly as advertised.

Three o'clock the next morning we emerged from our hotel into a chilling dampness. The intense blackness and falling mist augured ill for our plan to see the sunrise over the famous "sand sea" and Bromo crater.

Once outdoors, we finally located the ponies awaiting us. They were in charge of two 14-year-old guides, who had their heads and shoulders muffled in blankets and resembled nothing so much as a couple of turtles drawn within their shells.

A GLIMPSE DOWN BROMO'S FLAMING THROAT

The trip to the volcano was a long, uncertain ride over a trail we could not see. Now and then we crossed ridges where cold blasts of wind-driven mist sent a chill to the bone. At other times we skirted a sharp mountain wall. On the other side was only the blackness of night, except where scattered groups of twinkling lights far off below us marked the presence of villages on the plain.

Our horses frequently pitched down some unseen slippery descent or scrambled up a rocky cliff, with the guides clinging to their tails. We, poor creatures, clung to the saddles and our heavy camera cases and hoped for the best.

After traversing unforgettable miles, we reached the pass, where the trail plunges an abrupt thousand feet to the level floor of the sand sea. As we dismounted to clamber down the precipitous path on foot, the brightening dawn revealed a spectacle such as one would expect if suddenly transferred to the pitted surface of the moon (see illustration, page 344).

Once this great plain of volcanic ash, cupped in the depression between the mountain walls, formed a vast erupting crater. On the far side of the plain stands the more recently burnt-out cone of Mount Batok, ribbed as if it had been cast in a giant custard mold. At Batok's side, uneasy, rumbling Bromo acts as one of the many present-day safety valves for the troubled interior beneath the wide-stretching East Indian Archipelago.

The Dutch have in recent years built some 250 cement steps up the ashy side of Bromo. We climbed to the top and looked down into the yawning, sulphur-coated throat of the crater, where old Vulcan's blast furnace was roaring and spouting tongues of flame. Pungent sulphur-laden gas and steam came seething upward, and as the vapor plumed into the sky it caught the golden light of the morning sun.

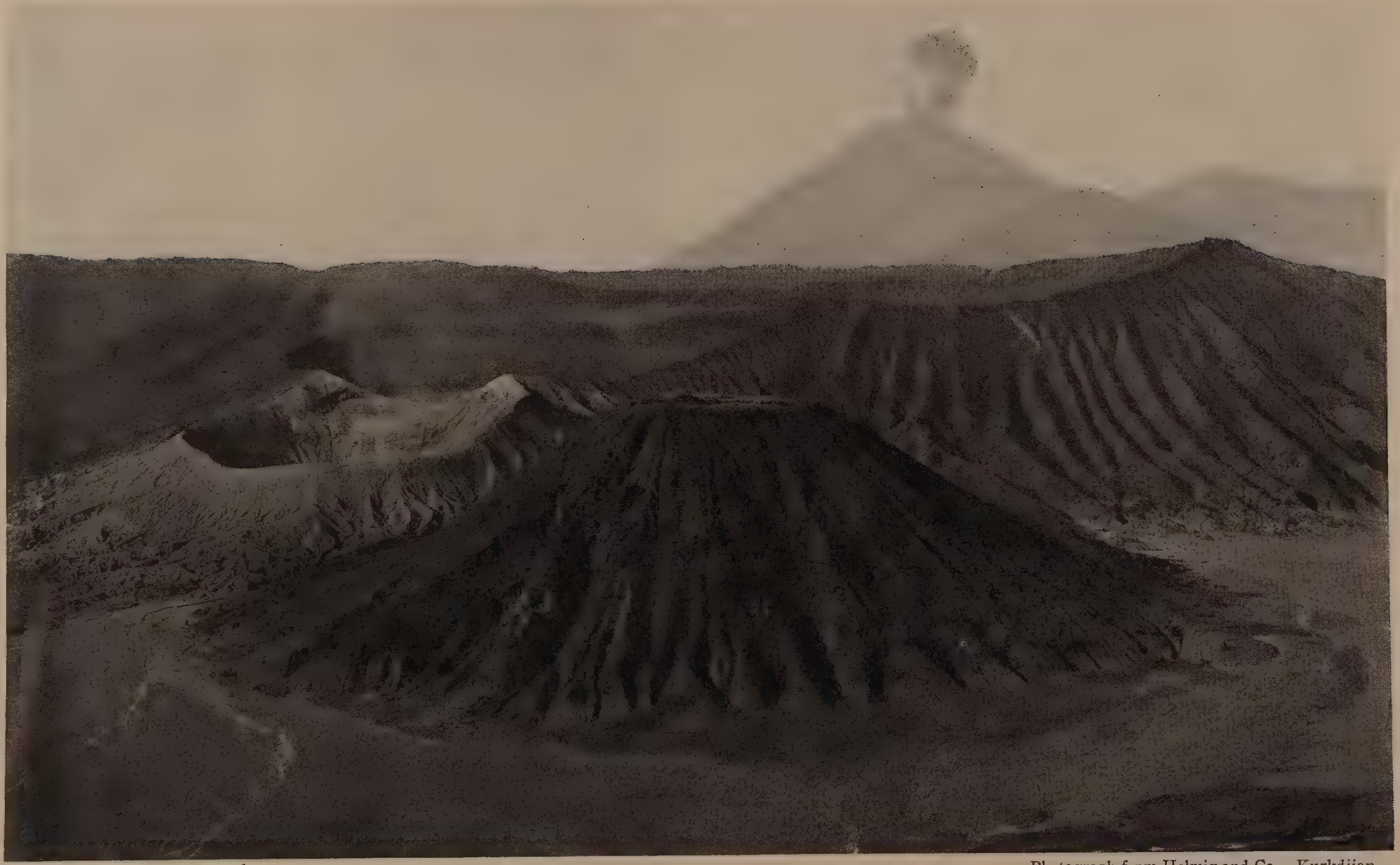
It is told that the natives in the region hold Bromo sacred. Formerly once each year they were accustomed to cast a young maiden into the flames as a propitiatory offering to the god within. In these later days of Dutch influence offerings of chickens and corn have taken the place of human sacrifice, and some of the daring young moderns, I learned, even climb part way down in the crevices and cheat the fiery god by rescuing the offerings for themselves.

As I worked under the focusing cloth of my camera on the narrow crater rim to get photographs of the glowing pit, my companion saw the ashes crumble around the tripod and expressed his conviction that I would shortly be the next sacrifice to the temperamental god. Our young guides wanted us to toss in a few coins as an offering. They then crawled a little distance down the crevices into the crater to show us their bravery and to suggest the acceptability of a reward. Later, presuming beggars, they ate our morning lunch that we had entrusted to their care.

Before the late morning clouds again obscured the hillsides around Tosari, we saw that those sheer heights were almost completely under cultivation, as indeed we found nearly all mountain sides on our rambles across the island. It is much as the old Michigan farmer once said of his hilly ground: "It's turned up edgewise, so you can farm both sides." The rich soil of the island is a great volcanic ash heap, and this is one of the chief reasons for Java's fertility and prosperity.

THE RICE TABLE'S DELIGHTS

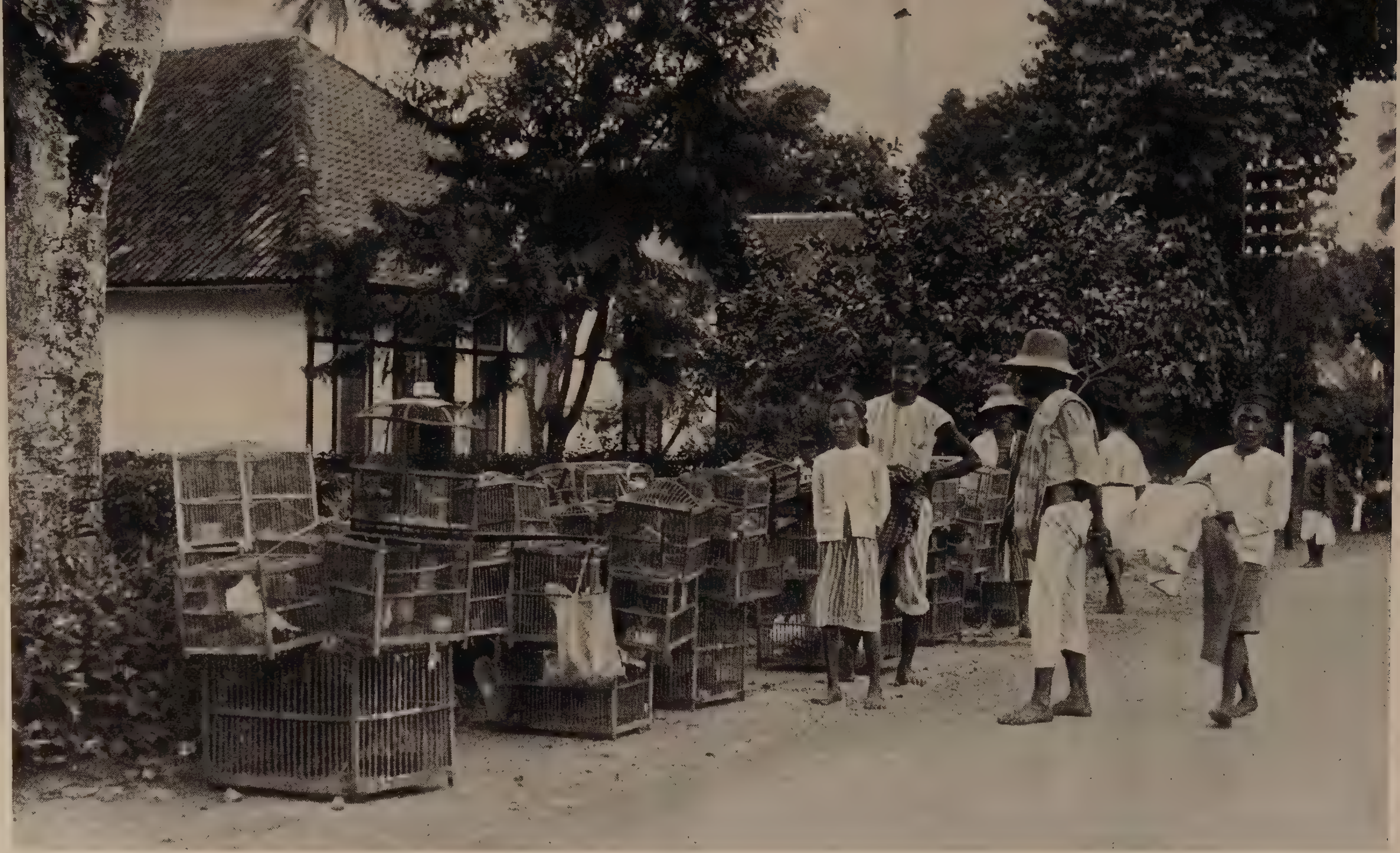
We hurried back through Soerabaja on our way to Soerakarta (Solo). Of our stay in the former city, I shall long recall our first introduction to the *rijst tafel,* or rice table. When the hotel boys pushed in two taxis, as they jokingly called the serving wagons, laden with condiments,



Photograph from Helmig and Co.—Kurkdjian

WITHIN JAVA'S VAST TENGGER CRATER LESSER VOLCANOES HAVE BURST FORTH

No more extraordinary panorama of weird and fantastic volcanic scenery exists anywhere else in the world. In the central foreground is the symmetrical cone of Mount Batok. In the left middle distance is Bromo, into whose seething pit at one time were hurled human sacrifices to the Fire God (see text, page 343). The smoking cone in the background is lofty Semeroe.



Photograph by De Cou from Galloway

BIRD AND CHICKEN PEDDLERS ALONG A JAVANESE HIGHWAY

Few indeed are the native homes in Java that have not some variety of feathered pet. Frequently a dove will be kept in a cage, which is raised each morning to the top of a high pole (see text, page 346). If the family goes on a journey, the bird goes, too.

Photograph by W. Robert Moore

GREAT OCEAN LINERS CALL REGULARLY AT BATAVIA'S HARBOR

Tandjoeng Priok, the port of Batavia, is about 6 miles from the city and is connected with it by rail and a canal. The port has a system of harbor basins, some of which will admit ships drawing 36 feet of water. In a recent year more than 4,000,000 tons of shipping cleared this port.

eggs, and meats variously prepared, together with many strange things, numbering in all upward of 20 varieties, to eat with our generous helping of rice, I soon learned the cause of the extreme popularity of long siestas and oversize waistlines. Decidedly, rijst tafel luncheons are a training for one's will power and one's judgment of capacities!

Traveling westward from Soerabaja over the flat countryside, with the high backbone of volcanic ridges to the south, one passes through the heart of the sugar-cane region. There are some 180 mills operating in Java, and these produce two and three-quarter million metric tons of sugar annually from the planted area of about 480,000 acres. The value represented by this one product is about 20 per cent of the exports of the whole Dutch East Indies. In fact, next to Cuba, Java is the most important cane-sugar producing country in the world. There is a large, efficient experimental station at Pasoeroean, where efforts are made to improve the cane as well as to combat its diseases.

As the train skirts the sugar town of Modjokerto one has to remind himself that the city was at one time decidedly more on the map than it is at present, for it was once the seat of the mighty Hindu Empire of Majapahit, which extended over Java and Sumatra. But, like many early capitals in other lands, only a few foundations and broken stones strewn about mark the historic ground.

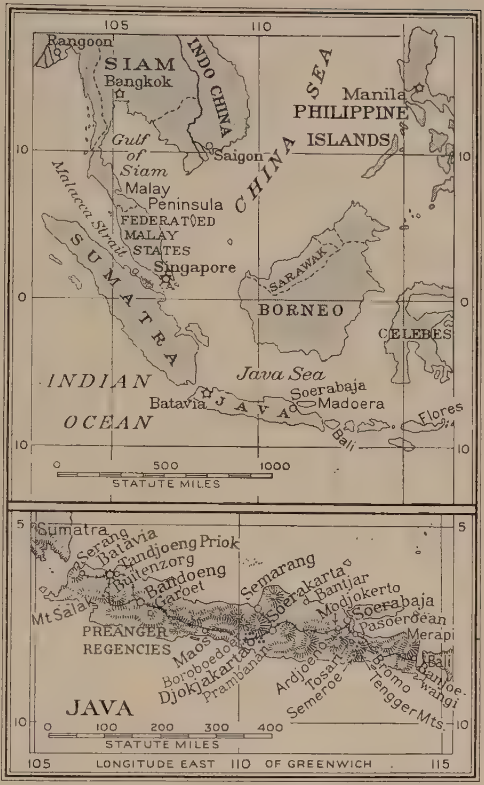
A BIRD CAGE FOR EVERY HOME

I had begun to doubt that Java (including the closely adjacent island of Madoera) had the large population of 727 people per square mile that is ascribed to it, because I could not see their *kampongs,* or villages, but I was ready to acknowledge almost any total of bird farms. On these, unfortunately, I could discover no statistics, but I saw hundreds of cages hanging on tall poles above clumps of green bamboo and among the towering betel palms.

Then I discovered my error. The native kampongs of the rural districts are hidden within those very bamboo thickets! Almost every native household has one or more cages of turtledoves or ring-tailed pigeons. Every morning the cages are pulled up on the poles and are brought down to the house again for the night.

The wants of a Javanese in regard to his home seem to be satisfied easily, for his house is usually built with walls of woven bamboo and the roof is thatched with leaves from the nipa palm. It is thus that someone has described him: "If a kindly Providence has blessed him with a virtuous wife, a couple of sons and daughters, a buffalo or two, and a *sawah* (rice field), the Javanese peasant has attained the zenith of his worldly desire."

Nearly all of the Javanese are Mohammedans; but in the eastern part of the island, where the Arab invasion had partially spent itself, there are still many traces of Hindu belief. Across the narrow strait, on the island of Bali,* Hinduism was never routed. The Malay mind of the Javanese, however, keeps him from becoming too fiery a Moslem, and even though some do visit Mecca, this fact does not seem to prevent many from building altars to the good and evil spirits which surround them.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Malay Peninsula
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Singapore
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Drawn by C. E. Riddiford

THE ISLAND OF JAVA, AT THE HEEL OF ASIA

With approximately the same area as the State of New York, teeming Java has three and a half times as many inhabitants. It is four times as large and has five times as many people as the Netherlands, to which it belongs.

WAYANG PLAYS CHIEF DIVERSION

The wayang plays are the supreme delight of the Javanese (see Color Plates V, VI, VII, and VIII). Although in every town Wild West thrillers from American motion-picture studios are enthusiastically cheered—the more exciting the better—yet it is the old wayang plays, which they know by heart and in which they can anticipate every posture, that move them with unbounded appreciation.

There is much variety in wayang performances, ranging from marionettes with movable arms, throwing shadows on a screen (see Color Plate X and illustration, page 349), to the favorite *wayang orang*, in which human actors play the rôles of mythical characters.

Like the plays in Siam and Cambodia, the wayang is a series of postures, a "slow motion picture," where each step or turn of the hand has its meaning. In the swift-moving Western World, after curiosity had been satisfied, such players would starve; yet in a pavilion in the zoölogical gardens of Soerakarta I found a troupe which in their thrice-weekly performances filled a "capacity house" and had large overflow audiences grouped outside.

One morning, through the kind help of the assistant resident magistrate and the owner of the wayang troupe, I was permitted to photograph the actors. As the grease paint softened on the face and arms of Woro Srikandi, the beautiful princess (see Color Plate XI) and her companions, and while Praboo Turondo Geni, the King of the Devils (see Color Plates V and VII), smothered behind his great curly beard in the open sunshine, I exposed color plates to my heart's content.

The most beautiful of the Javanese

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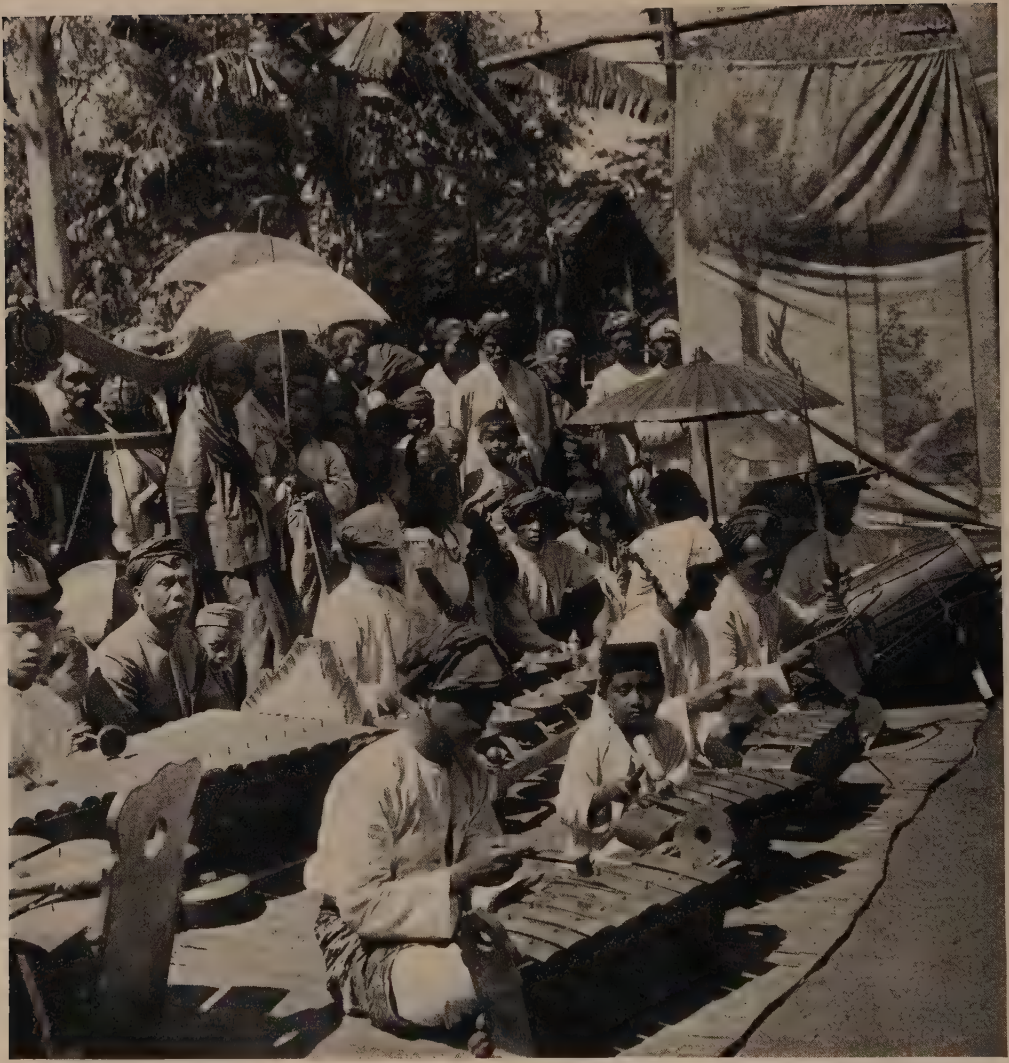
* See "Artist Adventures on the Island of Bali," by Franklin Price Knott. in the NATIONAL GEOGRAPHIC MAGAZINE for March, 1928.

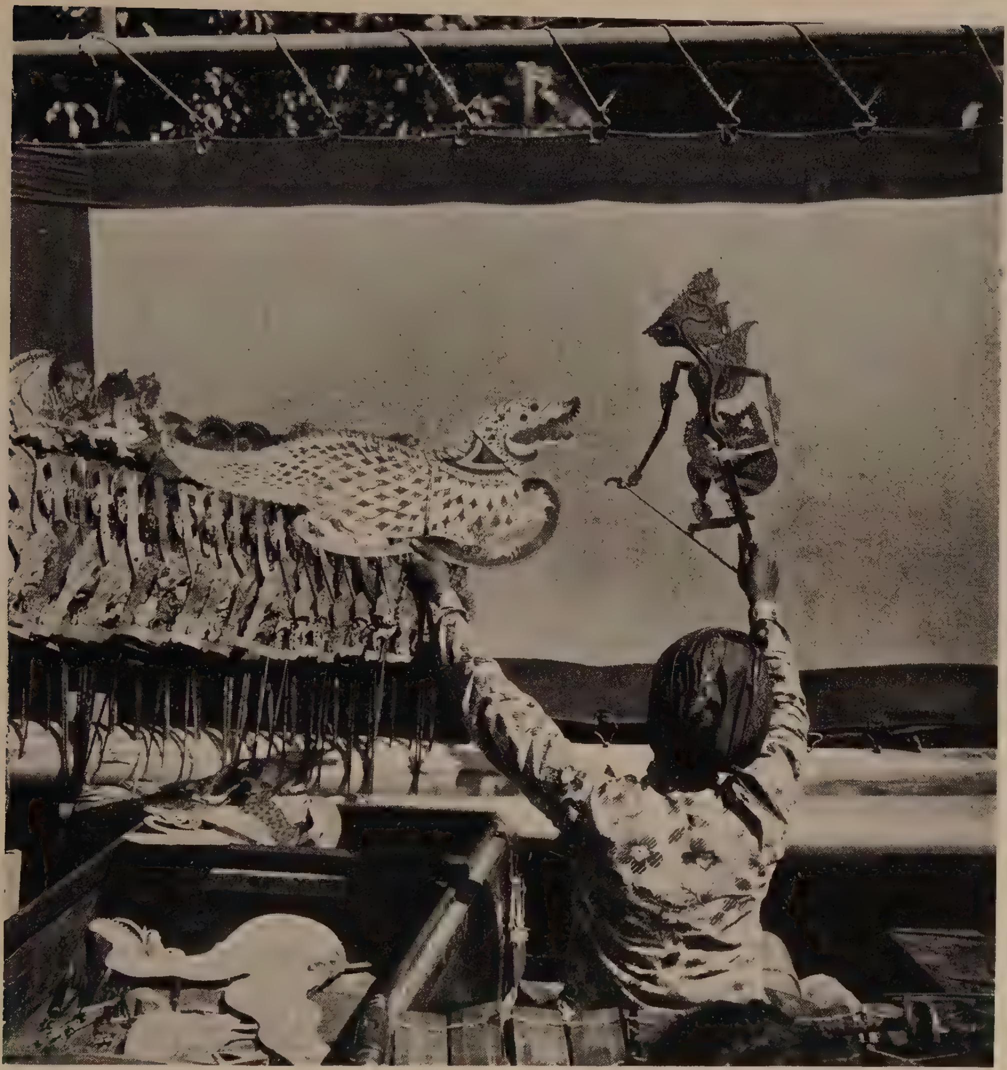


Photograph by Dr. Edward Burton MacDowell

THE GAMELAN'S MUSIC SPEAKS THE SPIRIT OF THE EAST

From 8 to 15 musicians make up a *gamelan,* or native orchestra, in which crude fiddles, gongs, bells, xylophonelike instruments, and drums are played in a minor key. At times plaintive and weird and again with great spirit and much crashing of drums and gongs, this music possesses distinctive charm.

dances are those of the *srimpi* and the *bedoyo,* which are performed only in the royal *kratons,* or compounds (see Color Plate V), at Soerakarta and Djokjakarta (Djokja), where native sultans still cling to the formality and splendor of the court life of early Java. The srimpi dance is performed on special occasions by four young girls who are usually descendants of sultans. They, together with the equally beautiful bedoyo dancers, reveal that perfection of artistry which graceful feminine movement has attained in the interpretation of ancient Javanese mythology (see, also, Color Plates VIII and X). Unfortunately, during our visit in Soerakarta, the court of His Highness the Soesoehoenan, one of the two great native princes, was in mourning over the death of one of the royal sons, so that the weekly practice of the dancers was canceled for the time being.



Photograph by Dr. Edward Burton MacDowell

HISTORY AND LEGEND PROVIDE THE THEMES FOR SHADOW SHOWS

In the oldest form of Javanese drama, living actors are dispensed with and a man who is hidden behind a screen operates various mechanical puppets or jumping jacks in front of a strong light, thus throwing their shadows on the white sheet (see, also, Color Plate X, and text, page 347).

Mingling with the crowd that streamed in and out of the kraton gateway were many members of the court, clad in short, dark jackets and long-skirted sarongs of beautiful brown batik. On their heads were perched shiny black hats shaped like small inverted buckets, and slipped under the belt in the back was the large-handled *kris,* or dagger. In mid-Java one may have the kris of his choice. Some like the sharp blades wavy, others take theirs grooved or straight; but, whatever the forging of the blade, all agree that the handle and sheath must be very ornamental.

THE BATIK FACTORY IS A SIMPLE ESTABLISHMENT

Present-day Java affects many strange combinations of foreign and native dress; but, from the Soesoehoenan to the servant, the sarong, or long, straight skirt, with a single fold in front, is almost universally worn. The better sarongs are of the native batik, but for those with small purses glaring aniline prints from Manchester take their place.

The batik industry is in itself most interesting, and in Soerakarta and Djokja, which are the centers of the trade, there are numerous small "factories." A few vats for dye, some pots of wax, and little bamboo frames on which to hang the cloth while working, together with women who have endless hours of time, and there's your factory!

The design is first sketched on the cloth with a pencil; then all of the intricate portions which are to be protected from the first dye are carefully covered on both sides of the cloth with melted wax. This is done by hand, by means of a tiny spouted cup the size of a thimble. By dyeing, removing the wax, rewaxing, and redyeing several times (usually in yellow, brown, and blue), the piece of batik is done.

Simple! Yes; but weeks, or perhaps months, of patient labor have gone into its making. Many factories now increase their output by stamping all of the wax on the cloth with brass blocks; but the quality suffers. Workers in the kratons produce beautifully designed batiks, the use of which is restricted to royalty and the court dancers.

GAMELAN MUSIC A GIFT OF THE GODS

I tried my best one morning to photograph some of the batik workers at their tasks of waxing the cloths. I had to get them to sit out in the sunshine in order to obtain the proper exposure. Several times, when I was about ready to make the exposure, the women would pick up their batik frames and flee to the shade to keep the softening wax from melting. They had no desire to spoil a month's work just to let me get a good color photograph (see, also, Color Plate XIV).

I went down in the market place to get a picture of some "hatters" cleverly folding up table-cover squares of batik into the turbans that are "Fifth Avenue" styles for the mid-Javan man (see Color Plate IX). I stayed to haggle and bargain for hours with some batik saleswomen. In Djokja and in Garoet they thronged the hotels, and repeatedly I weakened when I saw their excellent displays.

In Djokja we were allowed to make photographs in the kraton of the Sultan. On the morning of our visit some 50 men were rehearsing a wayang performance in the pavilion where the Sultan witnesses the plays and dances of the court. A gamelan orchestra toned an accompaniment to their recital, emphasizing portions with mellow gongs or softening other effects with dulcet, murmuring tones.

According to the Javanese tale, the gamelan was created by the great god Batara Goeroe when he sought to relieve the monotony of his long, uneventful life in heaven. The beauty of the music that he produced caused the gods and goddesses to perform the first joyful movements of the dance. Whatever its origin, the music is most appealing.

His Highness Sultan Hamangkoe Boewono VIII ordered a group of his bodyguard to appear in their full scarlet and white dress before my color lens as a gesture of friendliness toward the National Geographic Society in its effort to portray Java (see, also, Color Plates V and XI).

Almost every visitor to Djokja goes for a short trip to the ruins of Tamansarie, the old "water castle" of the Sultan who ruled in the middle of the 18th century. I followed the procession. Many of the rooms of this subterranean palace have been sadly wrecked by frequent earthquakes, which have had such far-reaching influence on the history of this island.

The walls of the castle are now covered with mossy-green fungi instead of tapestries; the gardens are grown up to vines and coconut trees, and in the pool which once served as the bath of the favorite princesses I found several urchins sporting about in the scum of the green water plants which covered its surface (see Color Plate IV).

All around Djokja the countryside is covered with Hindu ruins, and especially important are those of Prambanan and the famous Boroboedoer. The 26-mile motor ride out to the Boroboedoer temple was a delightful run through the cane plantations and rice fields.

Along the way we passed many two-wheeled bullock carts, with long roofs and colored sides of woven bamboo, hauling stalks of sugar cane to the mills. As we sped past one cart, which shortly before had had its fancy sides freshly redecorated,

DJOKJA IS THE CENTER OF AN INTERESTING NATIVE LEATHER INDUSTRY

© National Geographic Society
Autochromes by W. Robert Moore

BATIK CLOTHS ARE FASHIONED INTO HATS FOR THE MEN OF MIDDLE JAVA

In addition to these turban models, other strange styles are encountered. Some are like inverted flowerpots, while fezzes and a kind of sugar-loaf creation are also popular. Members of the police force sometimes wear what appears to be a section of black iron pipe.

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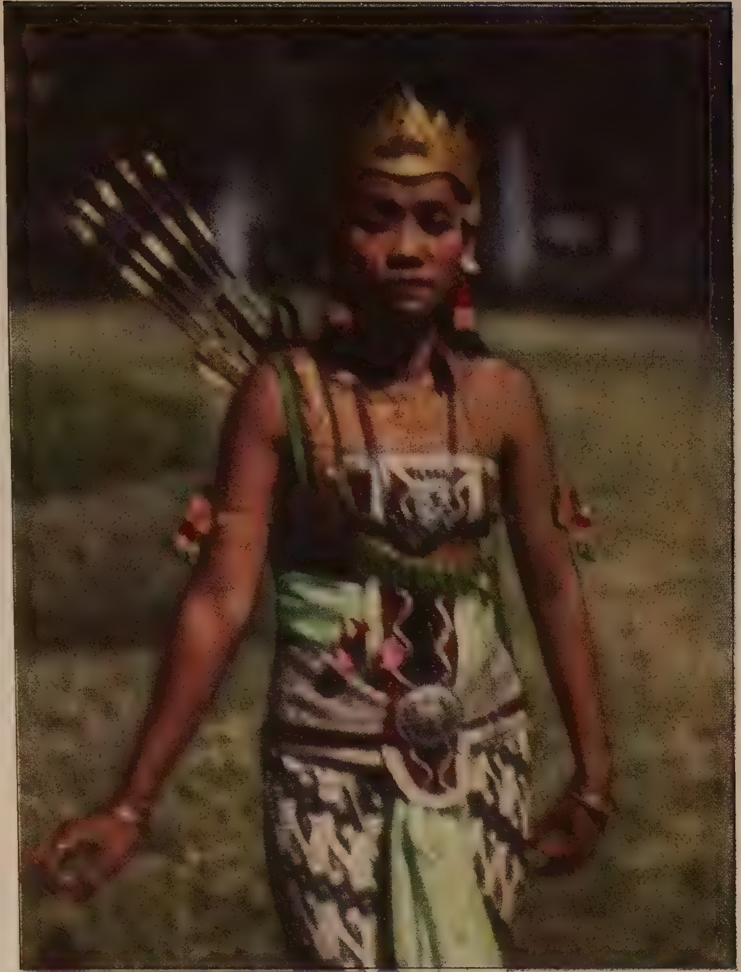
PUPPET SHOWS ARE THE FAVORITE NATIONAL PASTIME

Autochromes by W. Robert Moore

A YOUTHFUL DISCIPLE OF THE STAGE



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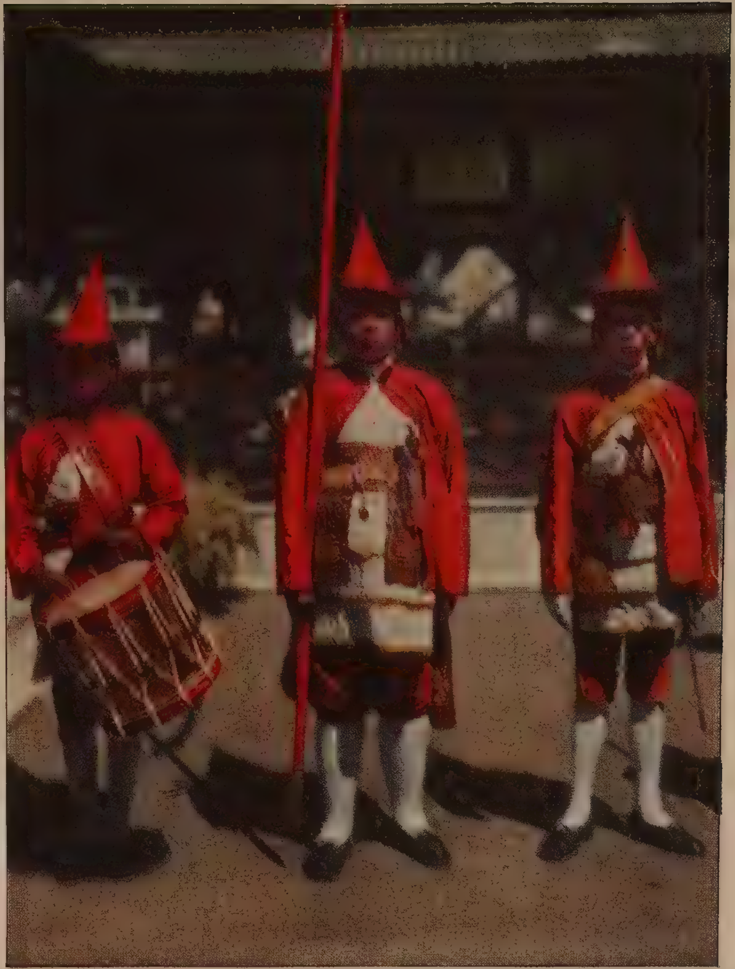
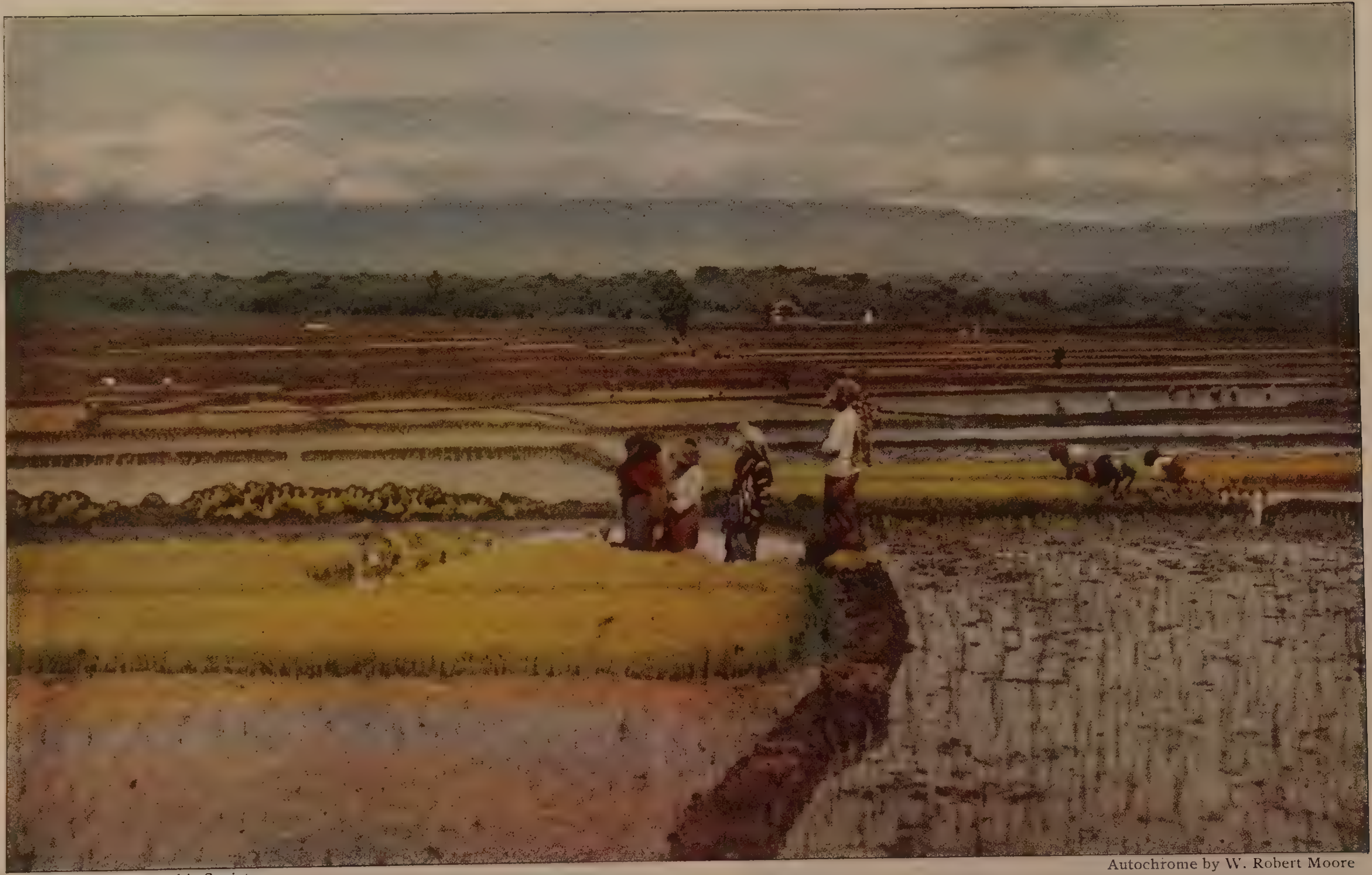
THE WAYANG PRINCESS PORTRAYS EMOTIONS BY THE POSITIONS OF HER ARMS AND HANDS



Autochromes by W. Robert Moore

NATIVE TROOPERS ATTACHED TO THE COURT OF THE SULTAN OF DJOKJA



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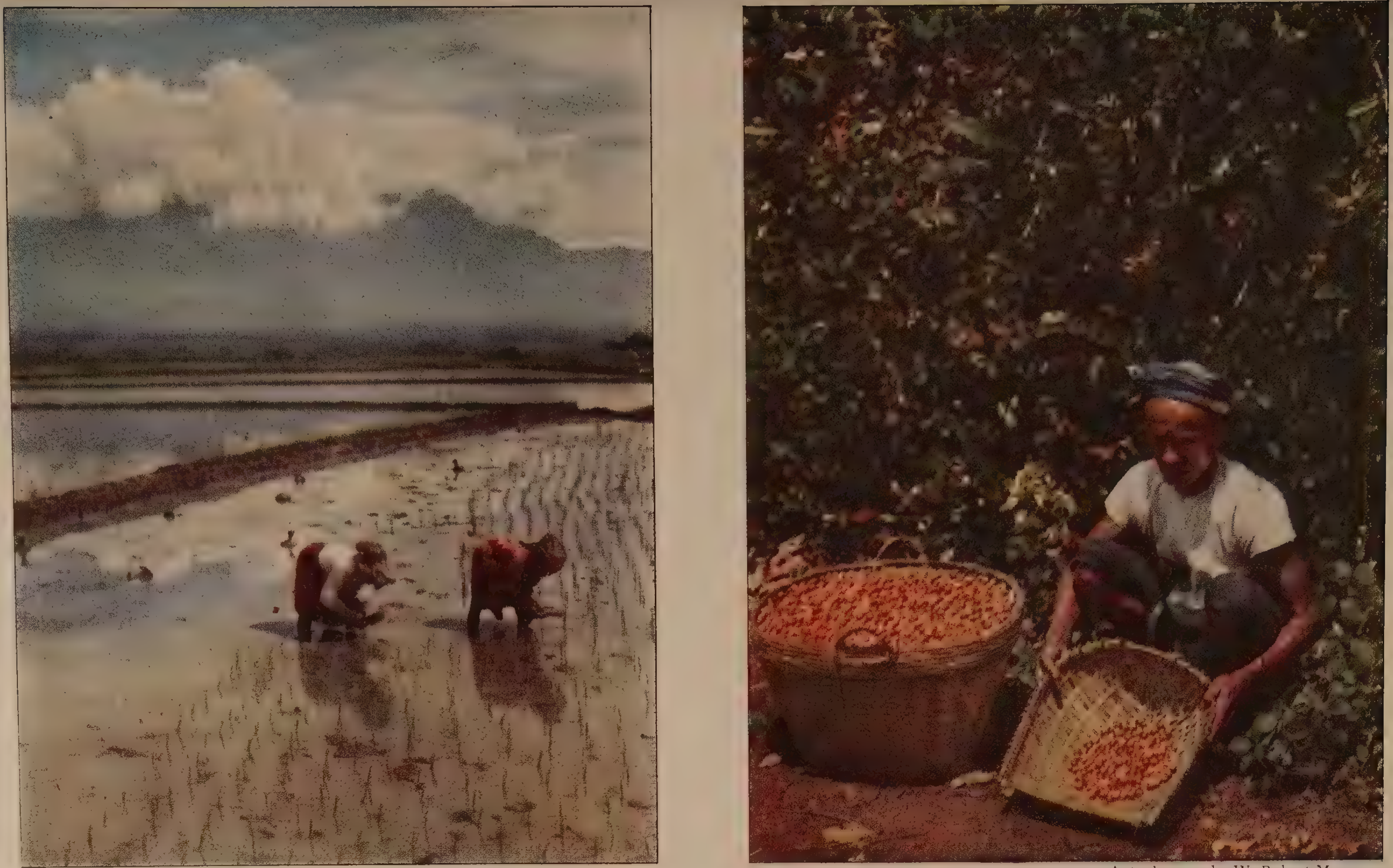
Autochrome by W. Robert Moore

THEIR TASK IS AS OLD AS THE AGES

The eternal quest for food is a vital problem for Java's teeming millions. Rice provides the solution, and the Javanese have cultivated it and relied principally upon it to sustain life for countless generations. They begrudge it no labor and flooded paddy fields are everywhere, rising like steps up the mountain sides and glittering in the tropical sunshine of the valleys.



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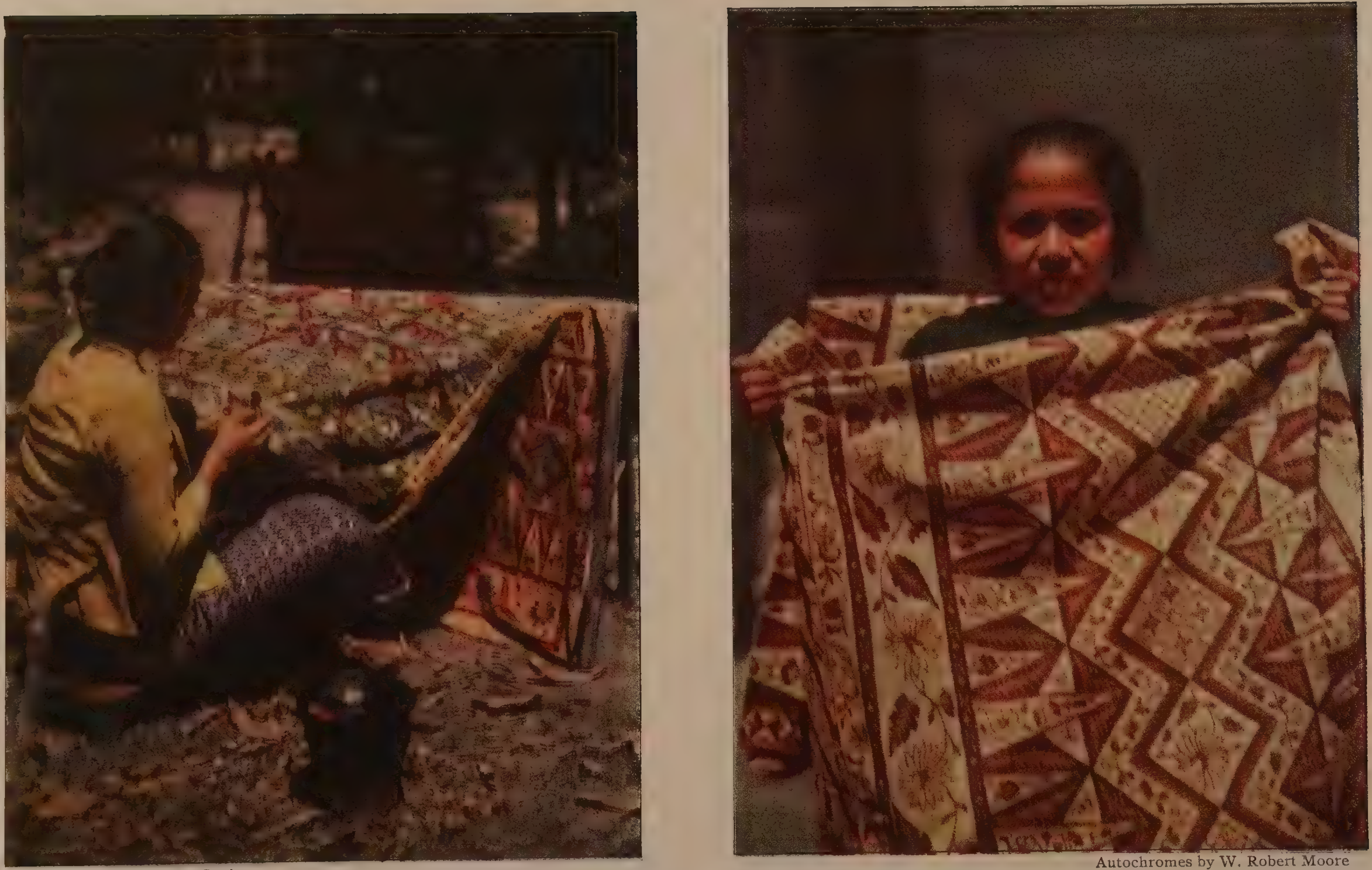
PLANTING JAVA'S PRINCIPAL CROP AND HARVESTING HER MOST FAMOUS PRODUCT

The women wading in the rice field are transplanting shoots of that staple crop. At the right a coffee picker rests with baskets of the berries that have spread the fame of Java around the world. At one time the island produced more than 100,000,000 pounds of coffee annually, but because of the ravages of a blight some of the land that was formerly devoted to growing the savory berries has now been turned to other uses.



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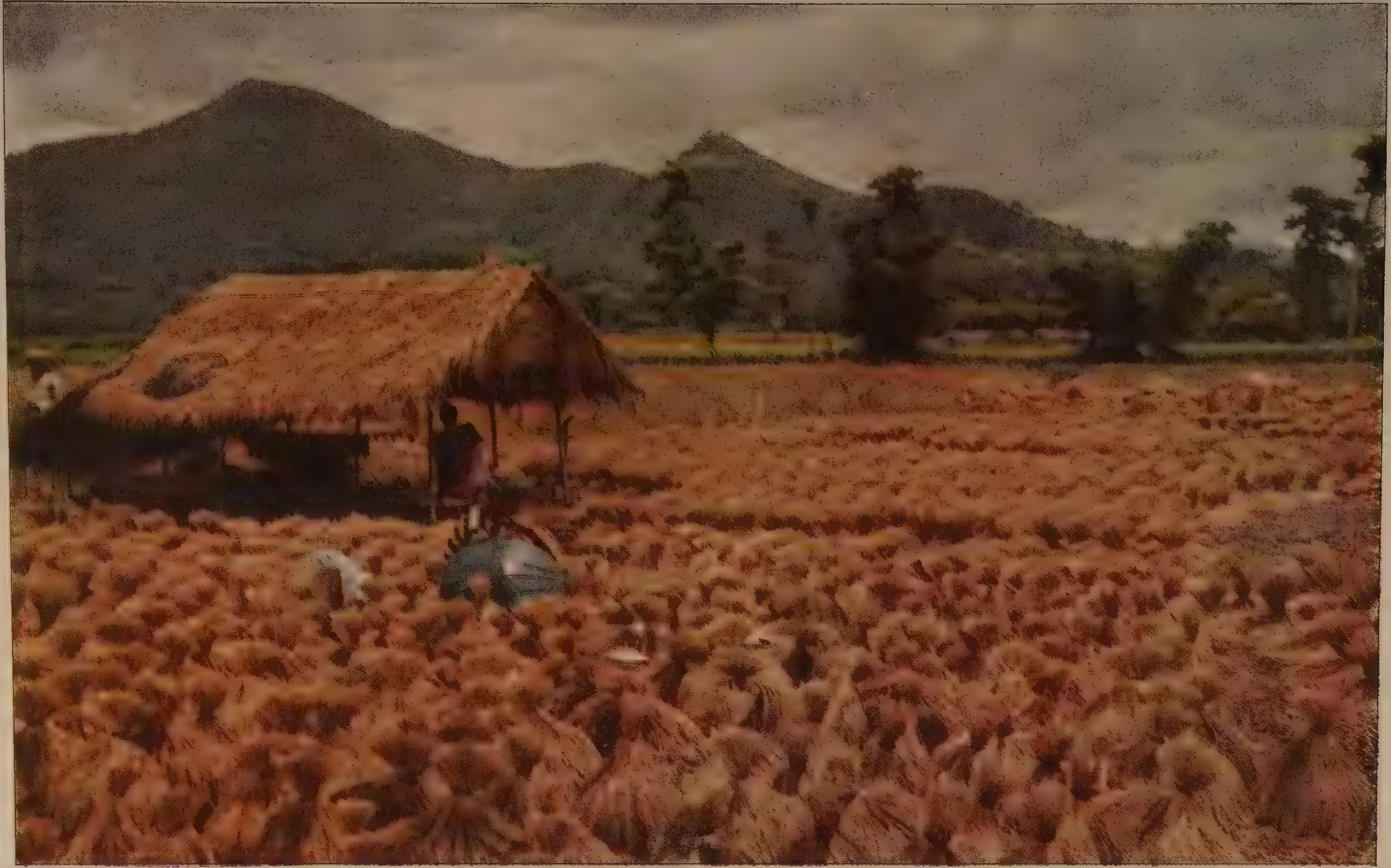
BATIKING REQUIRES A LARGE MEASURE OF SKILL, PATIENCE, AND ARTISTRY

Because of the tedious hand operations that go into its manufacture, a good batik may take several weeks to complete. This time element gives it a value which is beyond the reach of the poorer classes, and instead of using their handsome native product for sarongs and turbans, they turn to much cheaper and less attractive imported prints.



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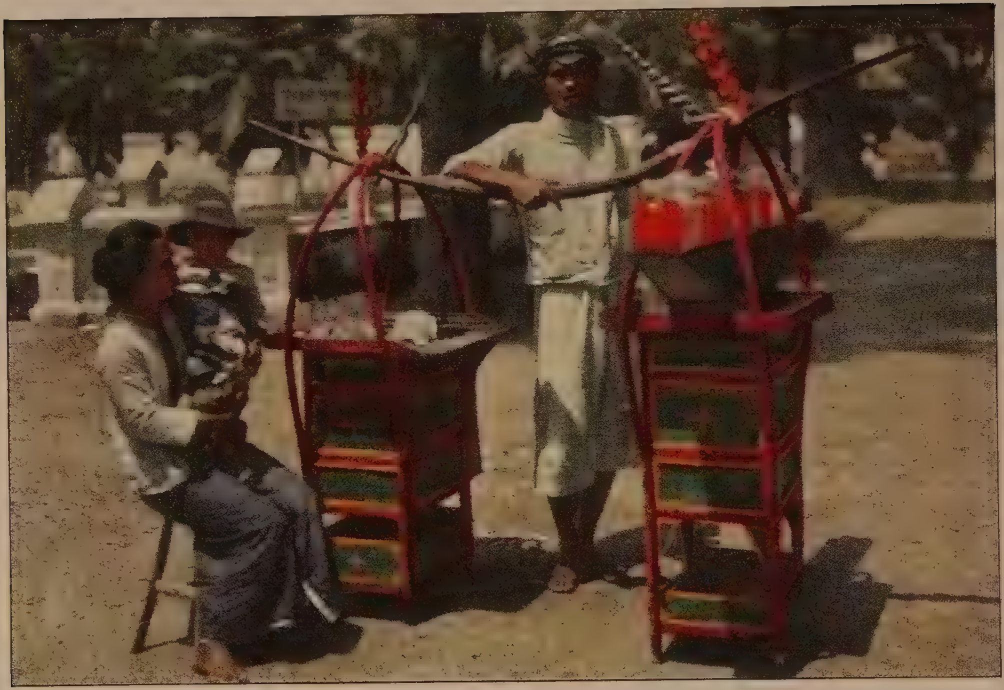
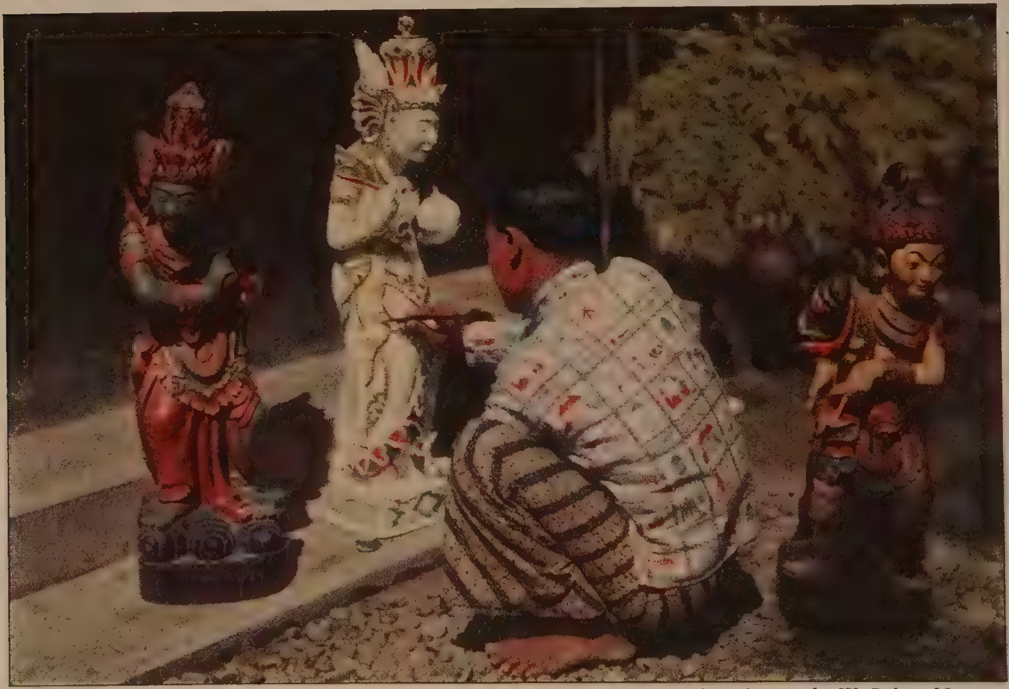
BUNDLES OF RICE HEADS BROUGHT IN TO DRY BEFORE THRESHING

Native women separate the grain from the chaff by beating it with a pestle in a wooden trough. Modern threshing machinery is practically unknown. The enormous yield of her fertile acres has earned for Java the title of "Granary of the East."



THE VENDER OF COOL DRINKS CARRIES HIS ESTABLISHMENT WITH HIM AT SOERAKARTA



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PAINTING STATUES FOR THE TOURIST TRADE

These figures are not a native product, but are imported from near-by Bali and retailed to travelers from the Western world.

I called a halt. I had to record those brilliant red, yellow, and blue pigments in their banded black and white frame. But getting the picture was a longer story.

When I asked the cart driver to stop, he spurned my suggestion and continued down the road. Gathering up the sprawling tripod legs under one arm and carrying the flying focusing cloth and plateholders in my other hand, I hurried after him, pleading *"Portret, portret,"* at every bound.

I like to think that it was his final comprehension of what I wanted, rather than the softening of his heart to humor someone who seemed mentally unbalanced, that finally led him to stop his two white bullocks to let me expose my plates! But, whatever the debate in his mind regarding my sanity, I got the picture (see Color Plate III) and we whirled on to Boroboedoer.

JAVA'S FAMOUS TEMPLE CROWNS A RICE-ENCIRCLED HILL

"It looks like a fancy wedding cake," said my companion, as the dagoba-topped ruins swung into view through the palm trees. "But really, you know, the Boroboedoer would go in Angkor Vat's waistcoat pocket," he later added, as he compared this monument with that old Cambodian temple.* Boroboedoer, which was constructed about A. D. 850, is more weathered than Angkor, as it antedates the Khmer ruin by three centuries; but it was never as pretentious in its construction or as delicately elaborate in its chiseled decoration.

The appealing feature of massive Boroboedoer is its situation. It crowns a small hill which rises alone out of palm-fringed rice fields, though not far distant from the slumbering volcano of Merapi. Angkor loses in impressiveness because it is built on a level plain. Many visitors have written about the Boroboedoer† and its moods, and I would but add my own appreciation for the efforts of those long-gone hewers of stone and my admiration for the creative sponsors of its building (see, also, Color Plate I).

From Djokja we hurried westward through the low, flat country near the southern coast, which is the most unhealthy region of Java.

Later the train climbed among beautiful mountains, but the view was unhappily soon blotted out by a heavy rain. On a branch line we spiraled around through the hills and rice terraces and dropped down to Garoet, still at the stimulating altitude of 2,335 feet above sea level.

"If you are fond of volcanoes, go to Garoet," advises a guidebook, "for active and dormant cones tower on every hand." And if you want to see the terraced rice fields at their best and beautiful Javanese girls, you'll also find them in Garoet.

We spent hours on the steep terraces outside the city, photographing the people as they raked the water-flooded fields in preparation for planting, and as they repaired the breaks in the narrow dikes where the water was cascading down into rice plots below.

In other fields the farmers were removing the rice seedlings from the nursery beds, and dozens of men and women were standing nearly knee-deep in the mud and water, busily transplanting the young green shoots into the narrow fields. In a nearby district we found numerous harvesters—more than 100 in one group—clipping off the ripened heads of rice stem by stem. Every stage of rice cultivation can be seen simultaneously in Java (see Color Plates III, XII, XIII, and XV).

The great mountain terraces and the famous wide-stretching plain of Leles, together with other rice lands in the fertile Preanger Regencies, have given Java the pseudonym "Granary of the East," yet every year she is forced to import large quantities of rice for her own consumption.

BATIK SALESGIRLS PROVE DISASTROUSLY CAMERA-SHY

Batik salesgirls, it seems, keep themselves well informed regarding new arrivals at the Garoet hotels, for by breakfast time the morning after our arrival several had already gathered around our veranda. All were attractive, some were

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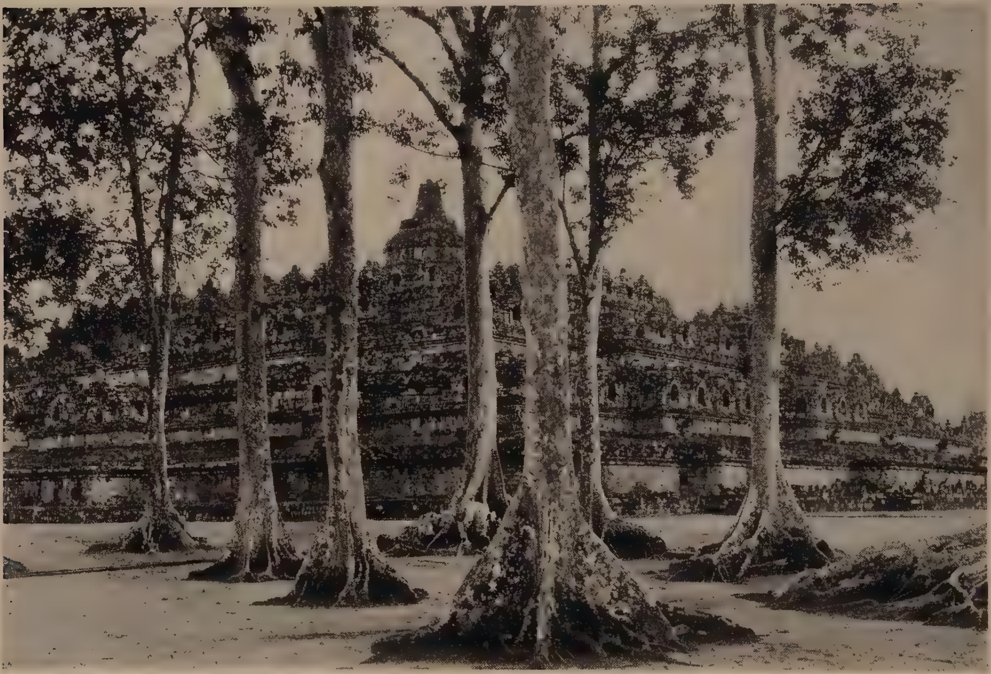
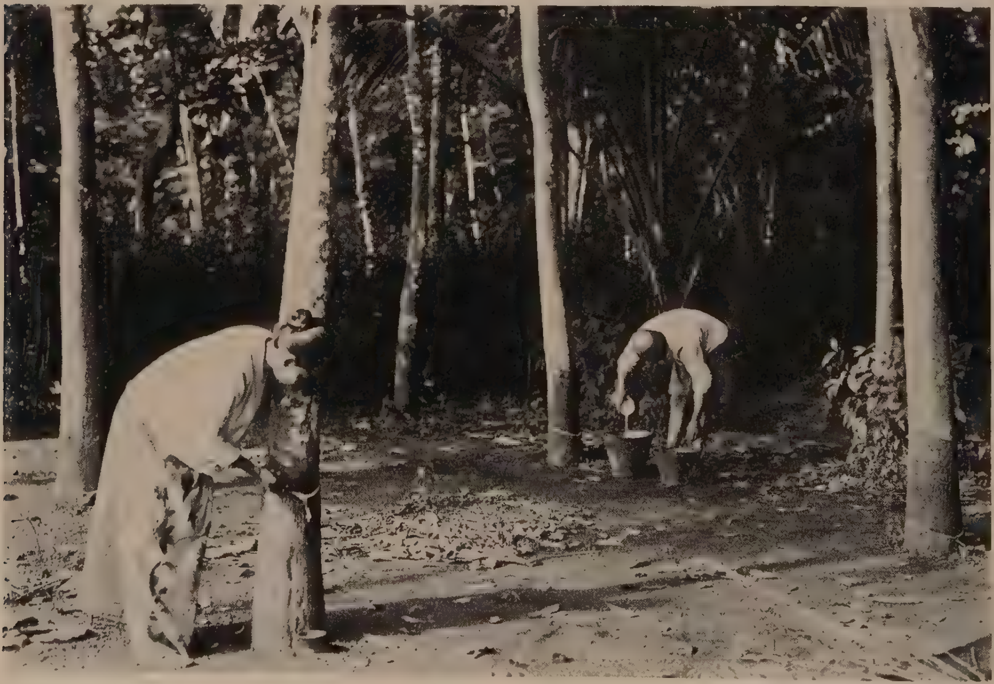
* See "The Enigma of Cambodia," a natural-color series of photographs by Gervais Courtellemont, in the NATIONAL GEOGRAPHIC MAGAZINE for September, 1928; also, in the same issue, "Four Faces of Siva," by Robert J. Casey.

† See, also, "A Traveler's Notes on Java," by Henry G. Bryant, in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1910.



WHERE JAVANESE ART REACHES ITS HIGHEST PINNACLE

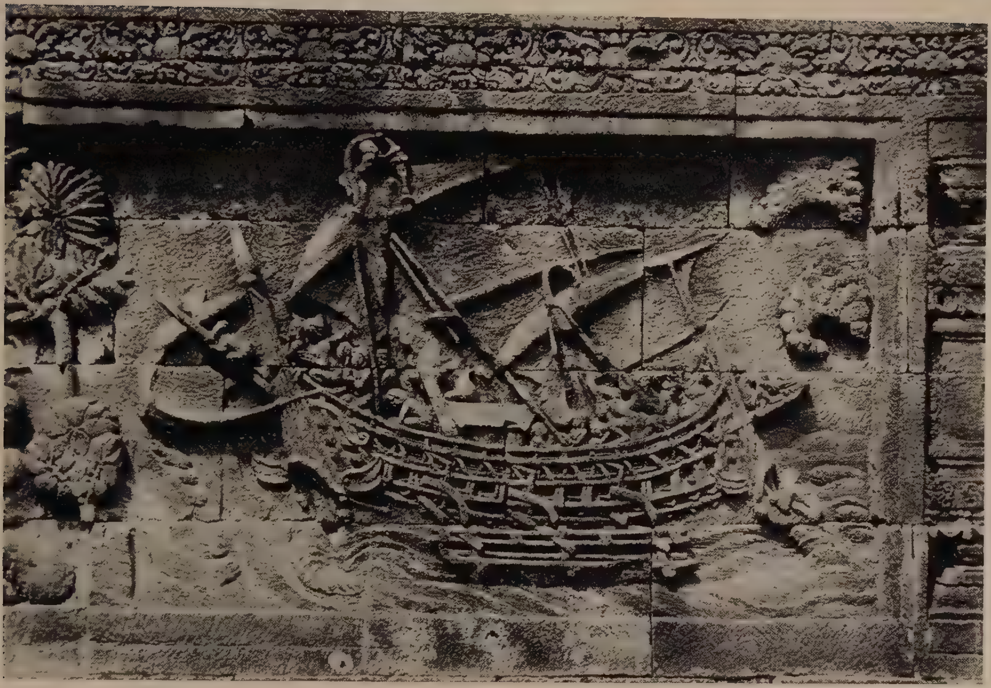
Boroboedoer was probably built as a reliquary to house some fractional portion of the Great Buddha's remains. Its skillfully conceived and executed galleries and terraces are unsurpassed in the field of Buddhist art (see, also, Color Plate I).



Photographs by W. Robert Moore

MUCH OF THE WORLD'S RUBBER COMES FROM THE EAST INDIES

When a rubber tree comes to bearing age, a tapper shaves off small areas of bark with a knife especially designed for this purpose. The latex flows from these wounds into small cups.



Photograph by Karl W. Scheufler

EXQUISITE CARVINGS ADORN BOROBOEDOER

A remarkable feature of the hundreds of bas-reliefs which embellish this magnificent structure (see opposite page) is that they are made up, for the most part, of numbers of comparatively small stone blocks, carved separately and set together like a picture puzzle.

beautiful, and each carried herself with queenly grace and poise. Long hours they pleaded with us to purchase their locally made batiks (many of them with Soerakarta stamps). I promised to buy if they would pose before my camera. At last one of them consented. When I developed the color plate that night she looked like a two-headed Janus, so much had she moved during the long exposure. When she returned the next morning I showed her the failure, tried to stir her pride, and offered to boost her sales for the day, hoping thus to induce her to pose again. But she turned me down with "Verree goot," and went to hunt up some other might-be purchaser.

Other pretty maidens, bold in making batik sales, but disastrously shy before the camera, caused me to leave Garoet almost in tears, bearing quantities of batik, but my exposed color plates hopeless failures all! I shall never forgive those Preanger queens.

Had anyone told me before I visited Garoet that there is music in bamboo I should have smiled at the attempt at humor. I was heartily surprised one afternoon when several youngsters appeared at my door and began playing on some bamboo instruments and dancing for my benefit. What? The famous *angklong* of the Preanger? There they were, just hollow bamboo tubes of different lengths, held in frames of bamboo which when shaken sounded the pipes.

The music produced by those youthful musicians was truly delightful. We fell so much in love with it that my companion bought all the instruments for a guilder (40 cents) or so. In a little while the boys were back with a new set, and as long as we stayed there they came several times a day to entertain us, hoping for more pennies.

Just off from the motor road between Garoet and Bandoeng are the fish ponds of Tjipanas. Such a delightful spot it is! At every turn a new vista met our eyes—sweeping coconut palms, tall, slender betel-nut trees, small bamboo houses, flowering green hedges, fishermen, all

Photograph by W. Robert Moore

MOUNTAIN, FOREST, AND FLOODED FIELD REFLECT THE CHARM OF JAVA

Water buffalo plod patiently through the muck of the rice fields, lending their tremendous strength to the production of food for the island's teeming millions.

doubled in the reflection cast on the mirror surfaces of the pools. Never before had I seen such a fascinating combination. We spent happy moments seeking yet new vantage points of the mirrored waters.

The ponds are used for cultivation of fish for market. Some are filled with salt water and others fresh, so that both kinds of fish may be raised. Among the most beautiful of the fish is the large goldfish, a species of carp, usually 12 or 18 inches in length when marketed (see Plate IV).

Much of the hill district in the Preanger Regencies is devoted to tea and cinchona plantations. The cinchona groves of Java, which have been developed from a few imported South American trees, now produce nine-tenths of the world's supply of quinine. Behind barricaded walls in a factory at Bandoeng, quantities of the invaluable malaria specific are produced, and the Dutch are protecting their secret formulas by garnishing the walls with barbed wire, as if it were a diamond-mine compound.

At this boom city of Bandoeng the railway, air service, and many other Government and private business concerns are establishing their headquarters.

We passed on to Buitenzorg, with its world-famous botanical gardens and the palace of the Governor General of the Dutch East Indies (see Color Plate II). One could spend weeks in the gardens, visiting the Natural History and Economic museums and in seeing the Government agricultural gardens, but other lands were calling.

As we moved out of Buitenzorg toward Batavia, there was one last picture that I wish I might have recorded on a color plate. The late afternoon sun's rays were touching the quiescent volcanic pyramid of Mount Salak (see Color Plate II). A group of slender, laughing maidens in flashing sarongs were filing homeward along the gleaming fields of tender rice; and an aged farmer, guiding an ancient plow, was urging two lazy water buffalo through the oozing mud in a near-by field—thus flashed the final picture before our eyes, epitomizing Java.

A VACATION IN HOLLAND

By George Alden Sanford

Author of "A Vacation in a Fifteenth-Century English Manor House," in the National Geographic Magazine

ONE who has a bird in his heart, they say, can see a flock in every bush. The same law holds true for one who has a vacation in his heart, who looks forward to seeing interesting places and things of the world; he is keen to see and recognize the possibilities of a "prospect."

It was Jan, our moon-faced Holland cook, who was always telling us about people and things in the Low Countries, who was responsible for this vacation. He interested us so much that in due time we leased for the summer, at approximately $100 a week, silver and linen included, the furnished Zee Droom Cottage, on the North Sea, where Jan had once served the family of a Rotterdam lawyer. Thus our dream of a vacation in the Netherlands was to come true.

After a preliminary swing through France, Switzerland, and Belgium, we bumped over the imaginary line which separates Belgium from the Netherlands and found ourselves in a new environment.

Rosendaal (Rose Valley), on the border, where baggage is examined, with its clean and tidy buildings and bright setting of roses, gave a hint of what we were to see in the land of our summer adoption. The ugly, prosperous smoke of Belgian factory towns gave place to peaceful meadows, where black and white Holstein cattle grazed contentedly and where an occasional windmill flirted us a welcome with its whirling arms.

ROTTERDAM, FIRST PORT OF CALL

Rotterdam was our first "port of call," but Rotterdam is a big commercial city and not nearly as "Hollandesque" as the smaller towns and villages, where old customs and costumes survive. It is well gridironed with canals. Sloops, barks, and boats of various types carry flowers, vegetables, cheese, freight, and passengers hither and yon; some are propelled by man power, some by horse, and others by wind and motor. There is little danger of nervous prostration from boat travel in Holland, but it is good fun.

We saw the Boompjes, which we judged, by the name, would at least be a fort, but beheld a street lined with little bushy trees. In Dutch, *boom* means "tree," and the final syllable *je* or *jes* is the diminutive "little," or is a term of endearment; so Boompjes means "little trees."

After a night in Rotterdam, we took train for Amsterdam; thence on to Alkmaar, in North Holland, where we transferred to a double-deck steam tramcar, which bumped its way along through hamlets and fields glorious with heather.

A SOCIABLE TRAM CONDUCTOR

These steam trams serve the small and outlying communities and are a great institution. The conductor became our friend, and when collecting our fares gave us a military salute and addressed me as Mr. America. He would linger for crumbs of information about the United States. He asked if we knew his cousin who lived in South Dakota. After an eight-mile ride the train deposited us at our summer home town, Bergen, on the North Sea.

If you have never been, even for a short time, a quasi-citizen of a strange country, you have interesting experiences coming to you. Tourists who tear through a country by motor car or on express trains miss many of the interesting sights and especially contact with the people. I agree with Mrs. Murphy, a protégée of Bishop Potter. In order that she might know the charms of the country, he transferred her there. In a few days, however, he met her back in the congested city. "Why, Mrs. Murphy," said he, "what are you doing here?" "Oh, Bishop," she replied, "people is better than trees." Which may be said of Hollanders. They come from a wonderful ancestry, the Batavians, who were great warriors and equally great in patient industry.

Nearly one-half of the country being below sea level, constant vigilance in watching the dikes is necessary;* otherwise it

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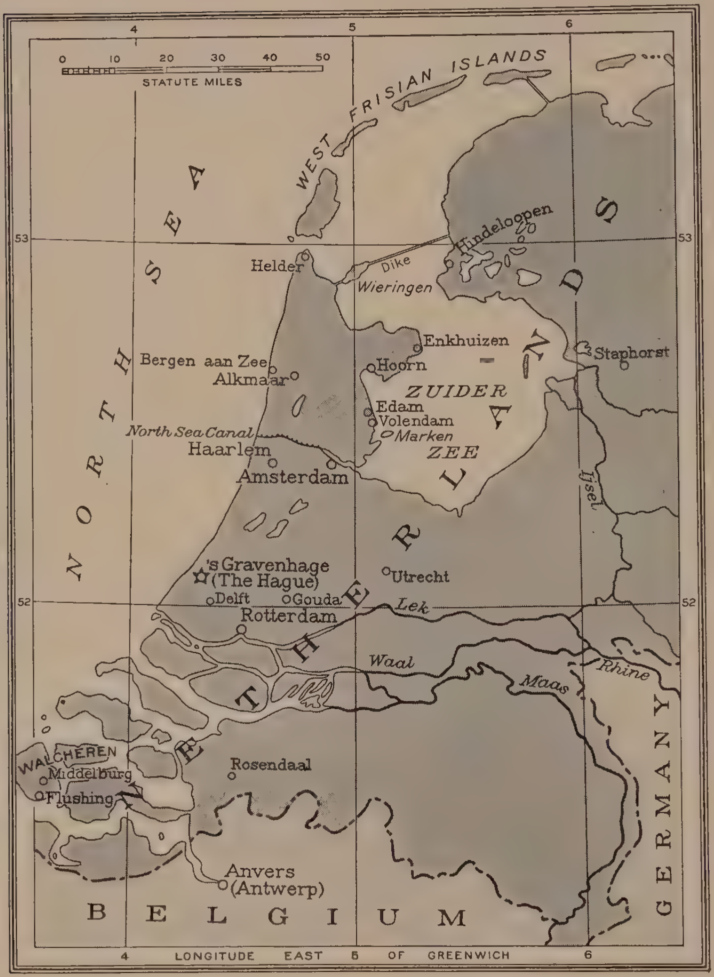
* See, also, "Holland's War with the Sea," by James Howard Gore, in the National Geographic Magazine for March, 1923.


0 10 20 30 40 50
STATUTE MILES
WEST FRISIAN ISLANDS
NORTH SEA
Helder
Dike
Wieringen
Hindeloopen
Enkhuizen
Hoorn
Staphorst
Bergen aan Zee
Alkmaar
ZUIDER ZEE
Edam
Volendam
Marken
North Sea Canal
Haarlem
Amsterdam
Yssel
THE NETHERLANDS
's Gravenhage (The Hague)
Utrecht
Delft
Gouda
Rotterdam
Lek
Waal
Rhine
Maas
WALCHEREN
Middelburg
Flushing
Rosendaal
Anvers (Antwerp)
BELGIUM
GERMANY
LONGITUDE EAST 5 OF GREENWICH
4
5
6
52
53

Drawn by A. H. Bumstead

A SKETCH MAP OF HOLLAND

On a land area about equal to the combined land areas of Maryland and Delaware, Holland supports a population of more than 600 to the square mile. The Nation's rich colonial possessions include vast holdings in the East Indies (Java and Sumatra, Celebes, Bali, and parts of Borneo, New Guinea and Timor), and Dutch Guiana and the Dutch West Indies in the Western Hemisphere.

would be back under the sea, from whence it came. There is a current saying in Holland that God made the sea, but man made the land. Now, Dutch engineers are reclaiming the Zuider Zee (the South Sea), which covers more than 2,000 square miles.

ZEE DROOM COTTAGE, A SUMMER HOME

We have wandered far afield from the Sea Dream Cottage, our summer home. Let us come back to it. The house is built of brick and tile, on the sand dunes, about 100 feet above sea level, and the idea of a sea dream was carried out in every particular. The iron balcony in front of the second story was a veritable "crow's nest" (see illustrations, pages 365 and 376). From it we could see a stranded British warship, the *Camperdown*, which was beached in a fog during the World War.

The beds were built in like berths, only more spacious. We had electric lights and grate fires. From the living room large plate-glass windows gave us a wide seascape. To protect the windows from high winds, which blow especially hard at night, heavy wooden shutters were provided.

These shutters also gave an opportunity for the owner, like other house owners in Holland, to take a fling at art. The type of art is usually of conventional designs in bright colors; but in the case of the Zee Droom, sea anemones, foraminifera, octopi, squid, lacy seaweeds, and other forms of sea life were the decoration motifs.

TRIALS OF CAKE-BAKING IN HOLLAND

On arrival at the Zee Droom we found our Jan in charge and everything spick-and-span. To his staff he had added his sister as housemaid and his mother as laundress. Everybody was untiring to give us a happy time in Holland. Living was much the same as at home, except that the setting for the picture was everywhere unusual. The milk boy served us from a

Photograph from George Alden Sanford

THE AUTHOR'S VACATION HOME IN THE SEASIDE VILLAGE OF BERGEN

Photograph by Melville Bell Grosvenor

DUTCH DAMSELS TALK SHOP

The fishing village of Volendam, huddled behind its bulwark of dikes, is a happy hunting ground for the artist and tourist, especially on Sundays when the fishing fleet is in from the Zuider Zee. Of course, one must always remove his wooden shoes before entering a house, even if it be but the village grocery.

milk cart drawn by a dog. Our fishman, generously broad of beam, brought us strange but delicious fish.

We had been away from home long enough to give the ladies a desire for some real American cake. They undertook to produce it, but the grocer didn't know baking powder. He sent us to the chemist, who produced a supposed substitute. The result of much discussion and experimentation was a great production, a genuine American cake, such as Mrs. Newlywed presents to her adoring husband, but which is known to the initiated as lead cake.

But we found a solace at the grocer's in East Indian chocolate, the finest member that we have known of that splendid family. It is a bitter chocolate of an indescribable but unforgettable blend.

We had a fine beach at Bergen aan Zee, wide and clean, with many *bad stoelen* (wicker chairs, with hoods to protect from the high winds) and bath wagons, where milady could don bathing garments and be drawn down to the sea by a horse.

One day in August the children had their innings; the cottagers pooled their guilders, and prizes were awarded to those whose sand forts resisted the tide longest.

The local church, Dutch Reformed, was always filled at the services. The ritual, in which all the people joined heartily, was beautiful. During the prayer by the domine, which was usually quite a long one, the men of the congregation stood.

THE BARRIER OF LANGUAGE

Some of our neighbors we came to know, but many were separated from us by the barrier of language. Of course, we could fall back on the sign language, which is but one step removed from the Stone Age, and which is by no means an exact science. Once in Spain I tried to explain to a hack driver that I wished to see the bull ring; but, as he seemed hazy as to my meaning, I sought to illustrate by putting my hands to my head to suggest the horns of a bull. "Si, Señor," he chattered, and we rattled away over the stones and brought up directly—at a dock. He thought I wanted to swim!

The Dutch language is difficult, to say the least. Some words seem related to the English, but most were incomprehensible to us. Lang Straat, Alkmaar, where we did our banking, is Long Street; but how about tooneelspeelster (actress), gemeenschappelijk (jointly), verstandsverbijstering (insanity—and the name is responsible for it), stoombootmaatschappij (steamboat company)?

LACE CURTAINS IN A CATTLE BARN

Holland is a great agricultural country, is thoroughly irrigated by canals, and has been fertilized by cattle for centuries. For beautiful black and white Holstein and Dutch belted cattle Holland takes the prize. On our way to Volendam we visited a cattle stable attached to a farmhouse. It was as spick-and-span as the *goede vrouw* could scrub it, and the windows of the stable were hung with lace curtains!

The cheese in Holland, especially Edam and Gouda, is excellent. Alkmaar is the center of the North Holland cheese trade. Friday is market day, and the visitor to Holland who misses attending it misses one of the most interesting sights there. Early in the day, trucks, carts, and boats of various types arrive, all loaded with cheese. The plaza about the attractive Weigh House (see page 377) is covered with thousands of golden cheese balls about seven inches in diameter.*

The farmer, wearing a black skullcap, is looking after his wares and for a prospective buyer. The "prospect" comes along and the farmer sallies forth. At first he is cold to the buyer's overtures, and after long bargaining scorns the offer made. Later, when the market is about to close, they get together again; the farmer plugs his wares (cuts out a small sample) for the buyer, and the sale is completed by "striking hands," which is a custom generations old. When this is done, the transaction cannot be reopened.

After the sale, porters, who look like members of a Pinafore Opera troupe, carry off the cheese in boatlike frames, and the unsold cheese goes to a factory, where it is prepared for shipping, and, lo, in due time, appears on American tables. But fresh cheese is as different as fresh fruit or vegetables. No wonder the favorite dinner dessert in Holland is "biscuits and *kaas*."

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* See, also, "A North Holland Cheese Market," by Hugh M. Smith, in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1910.

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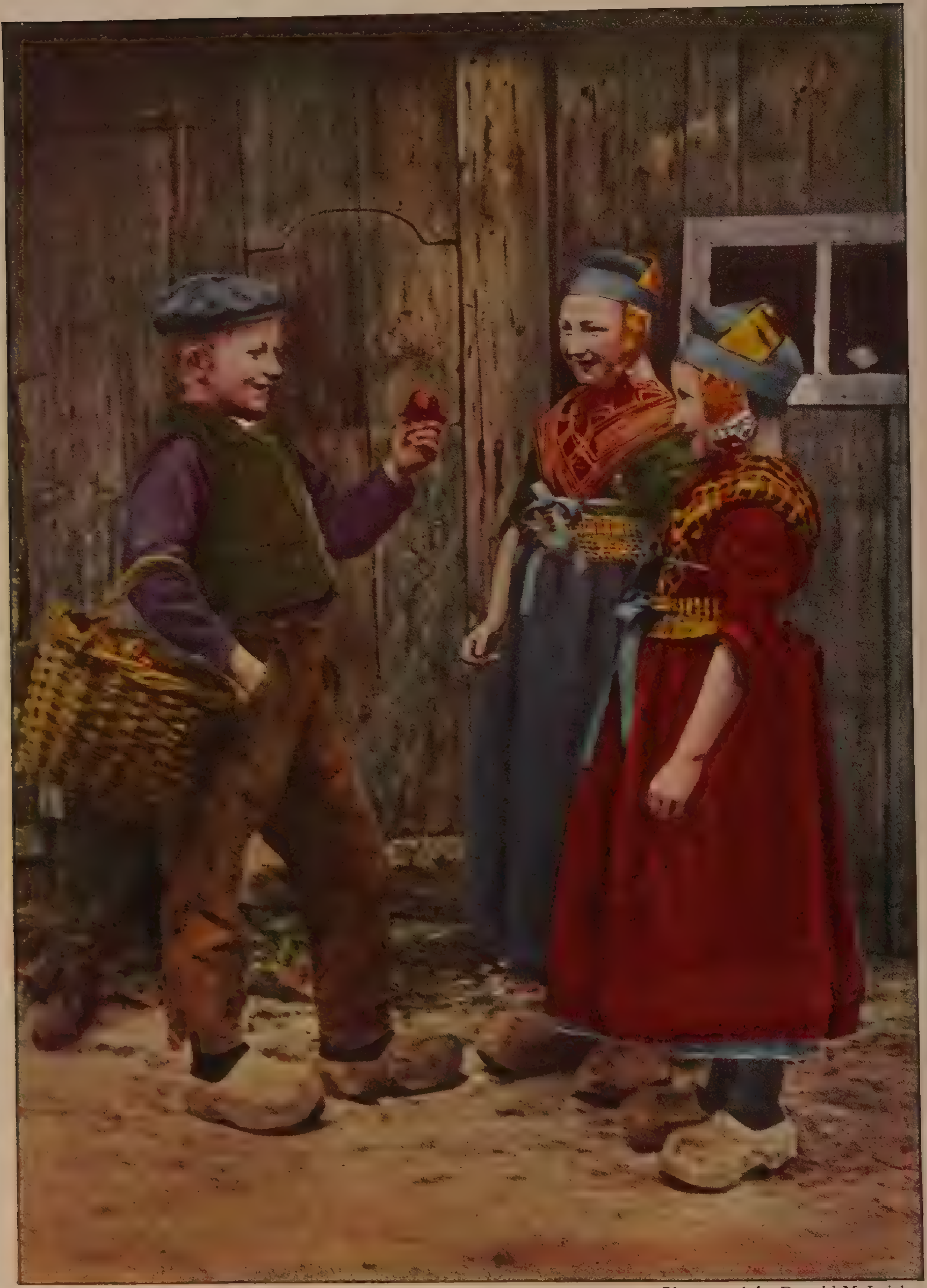
Photograph by Donald McLeish

STEAM AND ELECTRICITY THREATEN HOLLAND'S WINDMILLS WITH EXTINCTION

For centuries these monuments of a bygone industrial age have served as partners with the dikes to keep the Netherlands above the sea. There is something almost human about the old mills, and a society has now been formed for the preservation of those that have survived the ravages of time and progress.



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Photograph by Donald McLeish

AN APPLE IS STILL THE TEMPTER'S FRUIT

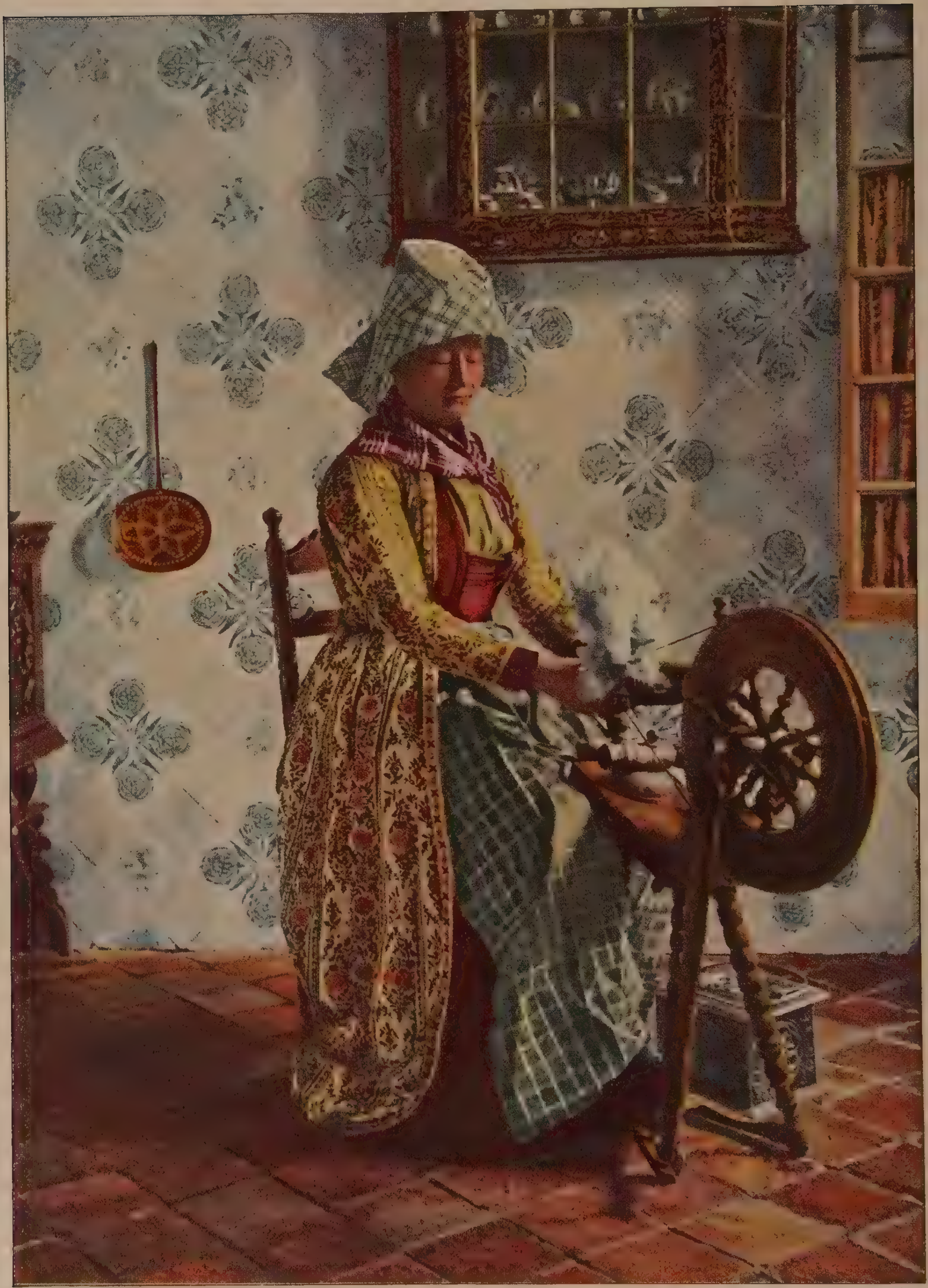
The young villagers are from Staphorst, in the Province of Overijsel, where the conservative peasantry still dress much as they did centuries ago.

© National Geographic Society

Photograph by Donald McLeish

FISHING BOATS BRING THEIR NIGHT'S CATCH TO THE QUAYS AT FLUSHING

The fishwives of Walcheren eagerly await the sea harvest that comes each morning. This port on the south shore of the island is a center for fishing fleets.



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Photograph by Donald McLeish

MODERN METHODS HAVE NOT SUPPLANTED HOME INDUSTRY AT HINDELOOPEN

Some of the ways of the past still survive in this quaint Friesland village, where tiled walls and floors are numerous and the use of the spinning wheel not unknown. It is one of the world's "bric-a-brac" headquarters and many reproductions of antiques are made here.

© National Geographic Society

Photograph by Donald McLeish

A MERRY MAID OF MARKEN EMBARKS ON THE WAY OF KNOWLEDGE

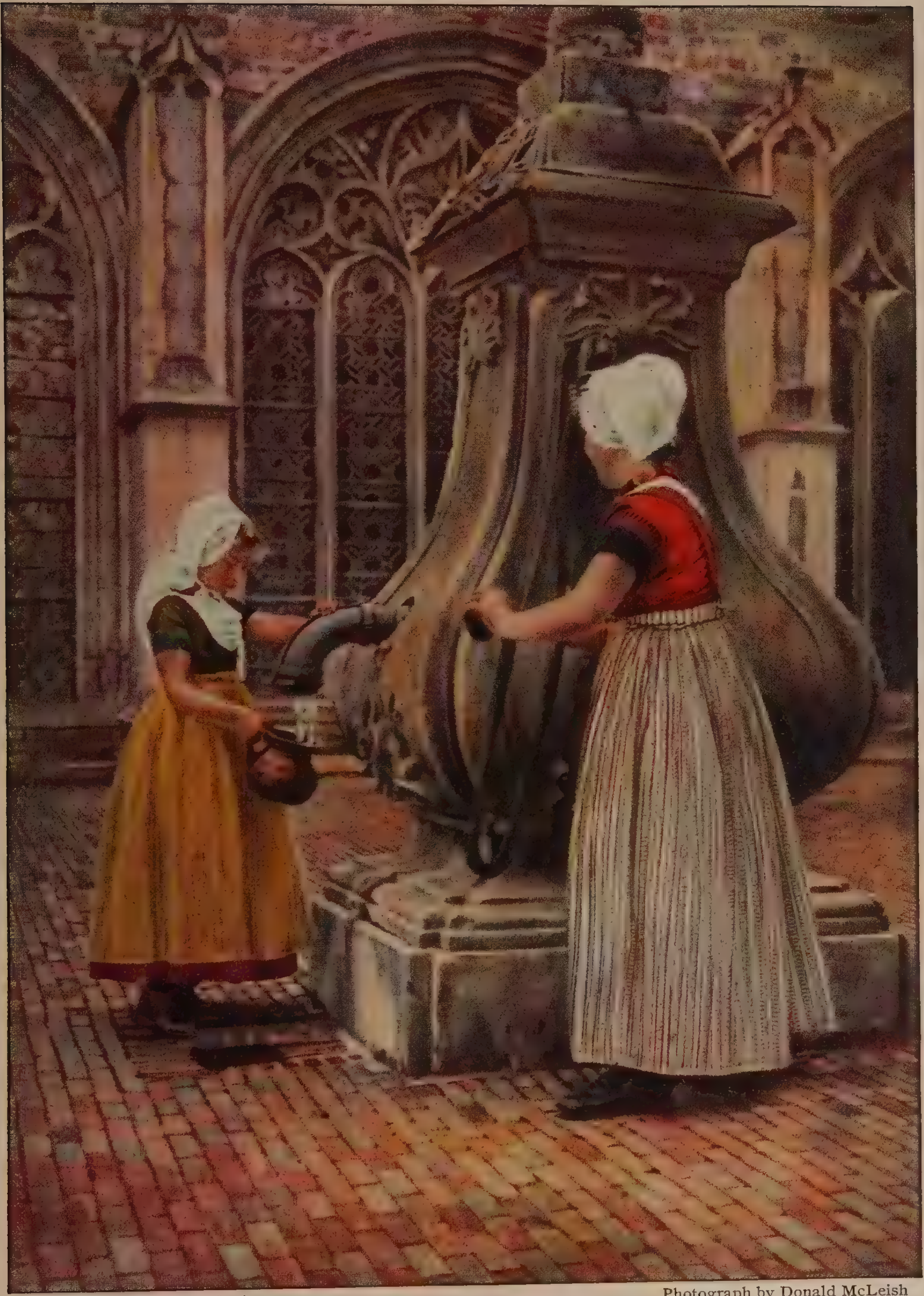
The isle of Marken is one of the most sophisticated of Holland's show places. When reclamation of the Zuider Zee is completed, it will become a part of the mainland, but its fisherfolk will retain access to the North Sea through a canal.

© National Geographic Society

Photograph by Donald McLeish

LEARNING THE SECRETS OF THE SEA FROM A MASTER

Volendam's old mariners are well versed in ocean lore and pass their knowledge on from one generation to another. Nearly everyone in the little town, which lies on the mainland opposite the isle of Marken, draws a living from the sea, and boys begin their nautical education at an early age.



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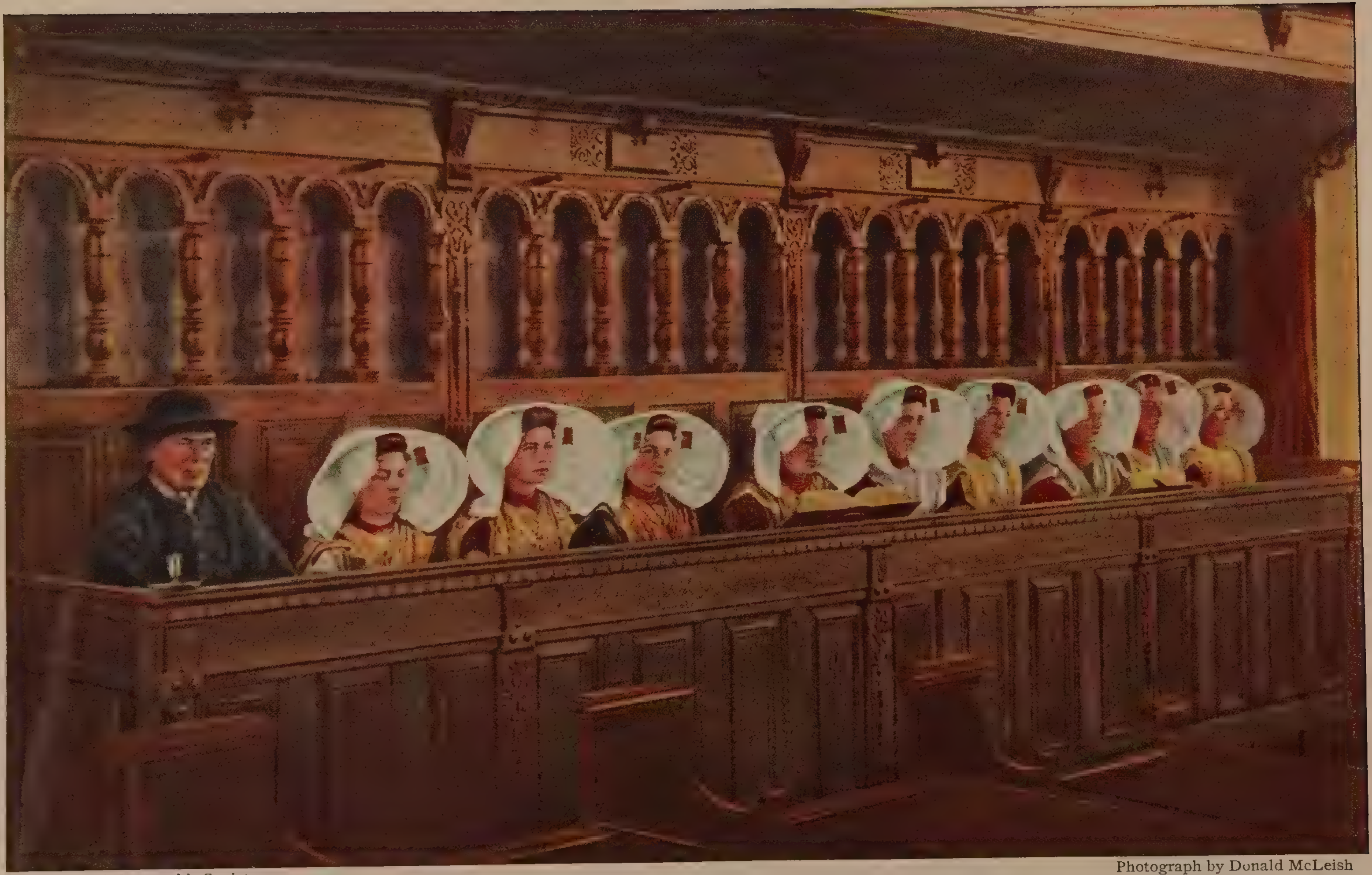
Photograph by Donald McLeish

GENERATIONS OF HOLLANDERS HAVE QUENCHED THEIR THIRST HERE

The ancient Abbey of Middelburg, in the court of which this old pump stands, dates back more than seven centuries and constitutes the nucleus around which the city developed. Thursday is market day in Middelburg, and the old city appears at its best as gayly clad peasants flock into town.



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Photograph by Donald McLeish

BOTH MEN AND WOMEN WEAR THEIR HATS IN CHURCH IN HOLLAND

Despite appearances, this is not a choir visible in Zeeland, but merely a side pew in an old village church. Although services are very lengthy and of a nature to impress foreigners as perhaps a bit lugubrious, men and women of the Netherlands are strict in the observance of their religious duties.

Roads in this country are mostly of brick and are very good. In a hired automobile, costing about $25 a day, we visited North Holland. On our way to Hoorn, so called because its tower of defense from the Zuider Zee is supposed to resemble a horn, we passed whole fields of bulbs, which constitute a major industry in this country. Quantities of crocus, hyacinth, narcissus, and tulip bulbs, running high in money value, are exported yearly. Fields of these blossoms light up the landscape with great splashes of color. The tulip is undoubtedly the national flower. The name was appropriated from the Persian language and means a turban. When I see tulips I always think of bright turbans on the heads of orientals.

In the 17th century Holland became obsessed by tulips. A single "onion" of the "Semper Augustus" sold for 13,000 guilders. The Horticultural Society of Haarlem offered a prize of 100,000 guilders, equal to $40,000, for a black tulip.

Practically the whole nation became infatuated at this time, and contracts were signed for immense sums of money paid for bulbs never seen by either buyer or seller. The Government intervened, applied the law against gambling, the price of tulips fell to nothing, and a panic ensued. "The Black Tulip," by Alexandre Dumas, deals with this bulb craze.

THE SMOKER'S PARADISE

We found the Westerkerk at Enkhuizen of great interest. Besides fine carving and architecture, the sexton showed us the consistory room, which savored strongly of tobacco. About a long table each of the elders and deacons had a seat bearing his name. On the table in front of his chair was a clay pipe with a stem about two feet long, the bowl bearing the owner's name. A brass censer on the long table was used for lighting-up purposes. Evidently, My Lady Nicotine had a part in councils ecclesiastical.

Holland is the smoker's paradise. Tobacco from the East Indies is cheap and, I suppose, good. I have seen boys of ten years puffing big cigars. A good cigar costs four cents American, to-day, while before the World War it could be bought for one cent. The men are furious smokers. I heard of an old Dutchman who had smoked all his life. In making arrangements for his decease he directed that all old smokers be invited to his funeral; each was to receive a pound of tobacco and a pipe and was asked to smoke during the service. Then he arranged for his favorite pipe and a quantity of tobacco and matches to be deposited in his coffin; for, he said, "One never knows what might happen."

HAARLEM, CENTER OF THE BULB INDUSTRY

We went by motor to Haarlem, which is a fine city and the center of the bulb industry. Its suburbs are jeweled with flowers. The flower market is something to dream about. In visiting the Netherlands, when in villages and towns one is wise to head up first of all for the flower market.

On the way back to Zee Droom Cottage we made a long detour to The Hague, with its House in the Wood, the favorite residence of the royal family. A Hollander remarked that the house "isn't much, but it is one of the most beautifully furnished châteaux in the world." The Hague is a great overgrown village, containing many palatial residences and avenues of fine trees; but after one has seen the splendid gallery, the Mauritshuis, the Museum, and the Library, he had better pass on quickly, for guilders here fairly evaporate. Thackeray, in his "Roundabout Papers," after extolling The Hague, grumbles because he was charged a guilder (40 cents) for a bottle of ale.

On Sundays, in fine weather, Queen Wilhelmina, her consort, Prince Henry, and the Princess Juliana may be seen walking to church like any well-to-do Dutch family.

Of course, this unique country, with its quaint homes, customs, and costumes, has always been a challenge to artists. Many of the Dutch painters occupy the first rank. They are exponents of the school of realism. Rembrandt, with his great pictures, "The Lesson in Anatomy" and "The Night Watch" (more correctly known as "The Sortie of the Banning Cock Company"), with its inimitable golden light; a dead tree by Ruysdael, a bull by Paul Potter—these do not belong to the realm of mythology or imagination, but to everyday life.

Photograph by George Alden Sanford

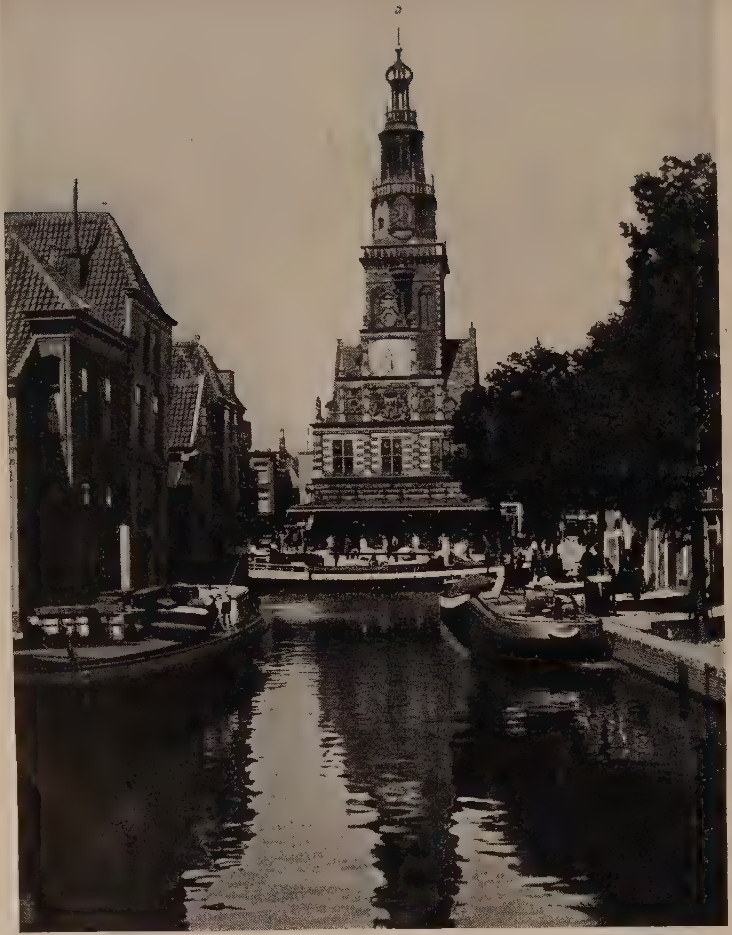
FLOWER STALLS ARE A PART OF NEARLY EVERY DUTCH MARKET

In addition to the flowers sold at markets, in many of the cities push-carts go from door to door vending the fragrant products of greenhouse and garden. In a recent year one market disposed of more than 50,000,000 blooms. These are flower stalls at Alkmaar.

Photograph by W. Van Dortmond

THE "CROW'S NEST" OF SEA DREAM COTTAGE

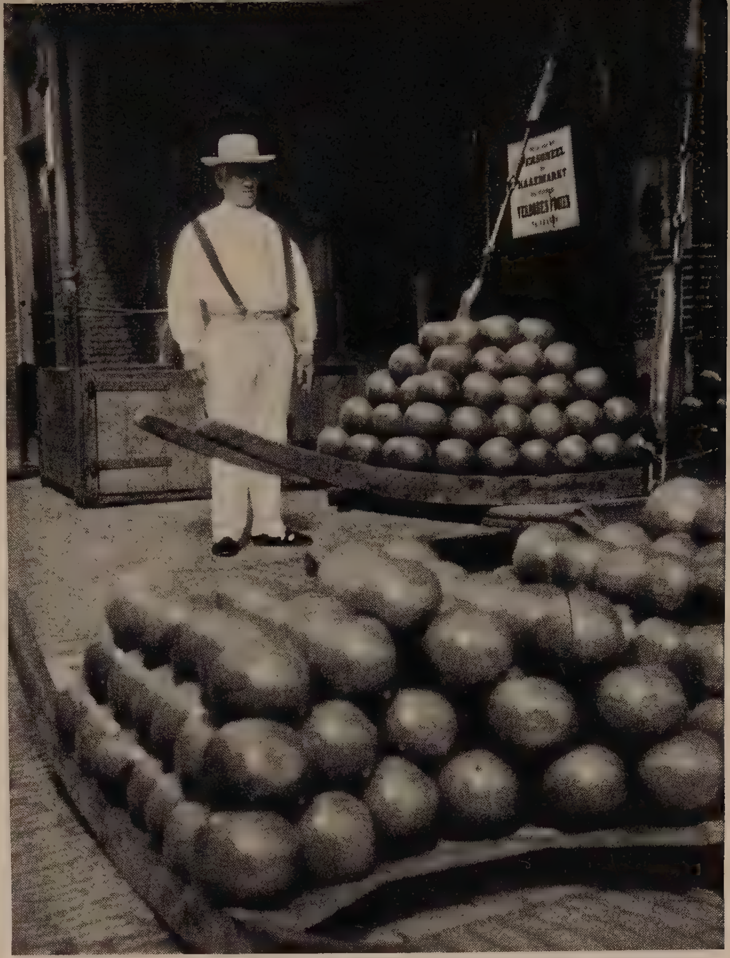
Among the sand dunes along the North Sea coast stands this brick and tile cottage which the author occupied during a summer spent in Holland. From the iron balcony, or "crow's nest," a fine view of the sea unfolds (see text, page 364).



Photograph by George Alden Sanford

ALKMAAR'S "WEIGH HOUSE" WAS ONCE A CHURCH

This interesting old building was converted to its present uses about 350 years ago. Under the canopy projecting from it are three wide doors, each giving access to a large beam scale upon which the cheeses are weighed. A fine carillon in the tower sprinkles the air with melodies.



Photograph by Emil P. Albrecht

CHEESE PORTERS ARE PERSONS OF IMPORTANCE

The white uniformed men who carry the cheese from ship to market, market to scales, and back to a ship again are elected to their positions for life by their fellow citizens. Despite hard work and small wages, the situation of porter is highly esteemed.

Delft we found to be a quiet, sleepy old town. It is the center of the tile industry.

The Nieuwe Kerk of Delft contains a magnificent monument to William, Prince of Orange, the father of his country. It consists of a recumbent sculptured figure of the Prince, in uniform, reclining on a black sarcophagus. At his left is the marble figure of his favorite dog, which gave the alarm and saved his life when he was attacked by Spanish assassins in 1572. Over the monument is a canopy, supported by four curious columns cut in marble. These represent four allegorical figures—Liberty, Justice, Courage, and Religion.

In the same church is a simple monument to Hugo Grotius, who was known as the prodigy of Europe. At the age of nine he composed good Latin verses, entered the university at twelve, and at fifteen became an ambassador.

In the Prinsenhof, residence of the Prince of Orange, where he was assassinated in 1584, a bullet-hole was pointed out. It was made by one of the two poisoned bullets fired at the great leader.

RURAL HOLLAND STILL WEARS STRIKING COSTUMES

The costumes of rural Holland are indeed unique. Women wear six or more skirts, lest the form be immodestly displayed, and a bright-colored waist with elbow sleeves, for strong, red arms are admired by men. The climax is a lace cap, the shape of which distinguishes the province in which the wearer lives.

Wives of rich farmers wear gold casques, like helmets, with ornamental gold curls. An ancient dame told us that hers cost a hundred guilders (about $40).

Workingmen wear exceedingly broad trousers, oftentimes colored vests, and short coats. Children and the poor wear *klompen*—wooden shoes. If you hear what sounds like a troop of cavalry passing down the street, it will more than likely turn out to be a group of school children returning home. Concealed weapons are not needed in Holland. In case of a row, a lad flicks off his klomp and wallops his adversary over the head. It has great weight in settling an argument.

A canal boat, tearing through the country at the rate of a mile an hour, is held up by a lock-keeper on the canal, who lets down a klomp by a kind of rod-and-line arrangement, and until the toll is forthcoming the boat passeth not.

Quite an anomalous but common sight is to see a small sailboat poking its way apparently through a field or meadow. Investigation, however, will reveal an unsuspected canal.

But, while we are junketing about, our time has slipped away and we must turn our faces homeward. We arranged to take an East India ship at Amsterdam and to be debarked at Southampton.

A GLIMPSE OF AMSTERDAM—THEN GOOD-BYE

While in Amsterdam we visited Kalver Street, one of the finest shopping streets in Europe. Here is silverwork of unusual design and workmanship—models of ships of many types; repoussé work, flat silver with windmill, stork, and other cleverly designed handles. The silver ships are used as wine-bottle holders; others are for ornament—silver sleighs, cheese-carriers, soldiers, and a multitude of other articles, tiny and beautifully wrought. To show how the Dutchman never changes, Kalver Street was so called for a calf market that once was located there. Now, although a jewelry center, it is still Kalver Street.

But our ship sails to-day and we must go to the docks. It seems strange to take a great ship of 12,000 tons in an inland city, 18 miles from the ocean; but the North Sea Canal solves that problem. It is stranger yet, at the ocean locks, to see the waters piled up from 5 to 12 feet above those of the canal, according to the tide, and with nothing to keep the inundation back but dikes and two locks, which look quite unequal to the task. The locks are opened only in calm weather.

The stewards on our East India steamer were Javanese—small, lively chaps wearing brocaded turbans. A study of the Javanese woods used in the ship's finish was of great interest. One variety, called palisander, was the most beautiful I have ever seen. It was cream-colored, with a heart and network of ebony black. I hope I shall have the good fortune to see it again.

So, good-bye Holland, with your quaint homes and ways, with your excellent and honest people, with your troops of happy children klomping along the streets, and with all your motoring and boatering.

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MANCHURIA, PROMISED LAND OF ASIA

Invaded by Railways and Millions of Settlers, This Vast Region Now Recalls Early Boom Days in the American West

By Frederick Simpich

Author of "The Geography of Our Foreign Trade," "Along the Nile, Through Egypt and the Sudan," "Singapore, the Crossroads of the East," "The Santa Fe Trail, Path to Empire," etc., etc., in the National Geographic Magazine

IN MANCHURIA, as in Egypt and Mexico, drama never dies.

From hereabouts, before Columbus was born, rode a Mongol horde to conquer Asia and harass Europe.

From here, scaling the Great Wall which timid Chinese had raised against them, came giant Manchus to oust the Mings and found a new dynasty at Peking.

Crossing the sea in clumsy junks 1,200 years ago, the same bold Manchus took tiger and leopard skins, ermine, and wild ginseng to trade with Japan for silks and brocades. Later, when the near-world empire of Kublai Khan rolled from the Yalu to the Danube, a Mongol fleet of a thousand ships sailed against the shoguns, only to be smashed by "God's Wind" on the coast of Kyushu.

Here, through turbulent years, three ancient empires met—the Bear, the Dragon, and the Rising Sun. Their struggles shook the earth. Korea succumbed, absorbed by the Rising Sun; the Dragon mothered Manchuria. War mangled the Bear, and to the north rose an evanescent Far Eastern Republic.

Only stupendous forces, far-reaching social changes in men's thought, life, and work, can thus twist a map and move its frontiers. It was so here. As border lines bent and broke, railways ran through; new towns were spawned in new-made streams of trade and new people came — tidal, sweeping seas of people, a mighty migration, far greater than when Israel quit Egypt, a migration perhaps without parallel in recorded history. Small wonder that the world watches this far nook of Asia to see what may happen next!

RAILROADS AND IMMIGRANTS REVOLUTIONIZE MANCHURIA

Yet in all its repertoire of high adventure—political, martial, and economic—two events loom largest in the stirring story of Manchuria. They sway not only the destiny of ancient Manchuria itself, but they affect the fortunes and the future of Japan, China, and Russia. These events are the coming of the Russian-built railways and the immigration of millions of Chinese farmers. In the last three decades these forces, railways and immigrants, have jumped Manchuria ahead by 1,000 years—moved her from a region of feudal lords, bandits, and nomad herdsmen to a land of huge trade and agriculture, in many aspects strangely like parts of the American West.

Photograph by Maynard Owen Williams

RUSSIAN LADS WHO ARE GROWING UP WITH HARBIN

This boom city of Manchuria is only 31 years old. When the Russians came to build the railroad, only one house stood where now rises this gay, colorful, pulsating Moscow of the Far East (see text, page 399). It is still Russian in appearance and is the only city in Asia which has nearly as many whites as natives. The Chinese control its administration.

So swiftly these changes have come that very often old and new still clash in oddly visual violence. Thus now, across South Manchuria, you may ride a crack train, smooth, shiny, and fast as any Broadway Limited or Frisco Flyer—a solid train it is, of American Pullmans, drawn by a big Baldwin locomotive made in Philadelphia—yet from its observation car you may see peasants pushing wheelbarrows with sails on them—a type of vehicle old in China when Confucius was a baby.

Steam shovels made in Milwaukee are moving mountains; Yankee tractors, jerking a fleet of plows, scurry across the virgin plains, past walled hamlets where yellow men scratch garden patches with wooden hoes, as in Bible times. A long walk, for farmers, from the days of Abraham to Henry Ford.

STORMY AND EVENTFUL IS THE STORY OF THIS NOOK OF ASIA

Fascinating, indeed, is the long, colorful story of Manchuria's youth and middle years, and the dramatic rise of the Manchu dynasty, when a handful of Bannermen took Peking and ruled all China from 1644 till 1912.

But to see why, to-day, Manchuria is the most prosperous and rapidly developing region of all Asia, one need look back only as far as 1894. That year, when Japan invaded Manchuria and defeated China in a dispute over Korea, marked the dawn of a new era. At the end of the war China, by the peace of Shimonoseki (April, 1895), ceded to Japan in perpetuity all land south of a line drawn from the mouth of the Yalu to Newchwang, an open treaty port on the Liao River.

Russia, France, and Germany intervened, however, and induced Japan to give up this concession, lest it jeopardize the peace of the Far East. Japan complied.

As early as 1639 Russia, of course, had found her way to the Amur. By 1860 she had acquired the vast Maritime Province, a veritable empire, stretching from the

Photograph courtesy South Manchuria Railway

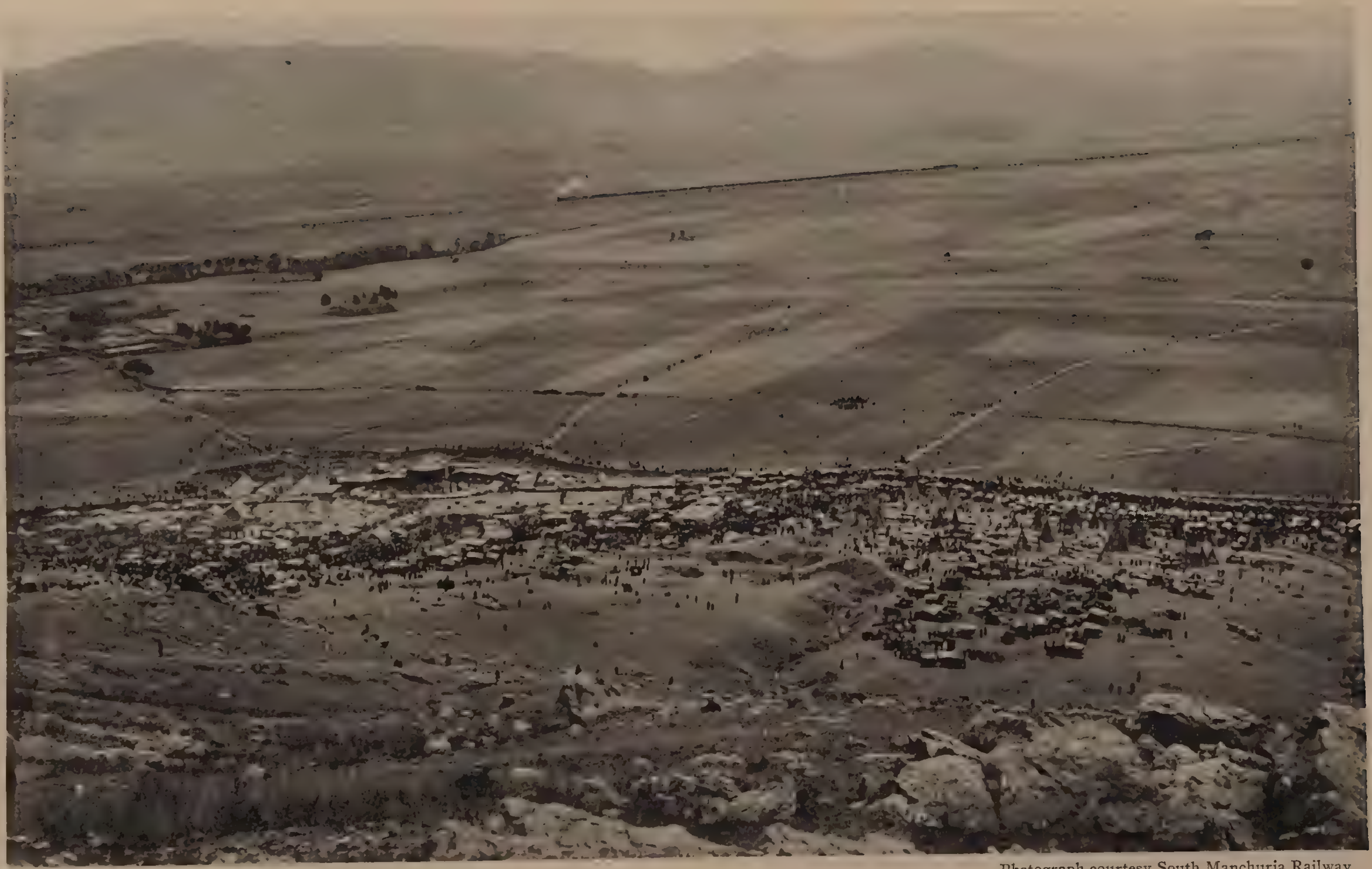
THE CHINESE FARMER HOES HIS OWN ROW IN MANCHURIA

Millet, wheat, and beans are the great crops of northern Manchuria. The sorghumlike *kaoliang* grows better to the south, and from it a strong liquor is distilled. Such distilleries and the bean-oil mills are among the chief industries. Near Kungchuling the South Manchuria Railway runs through this level rich region, which resembles Iowa.

Photograph by Alice Schalek

A NEWCOMER IN THE WORLD'S COMMERCE

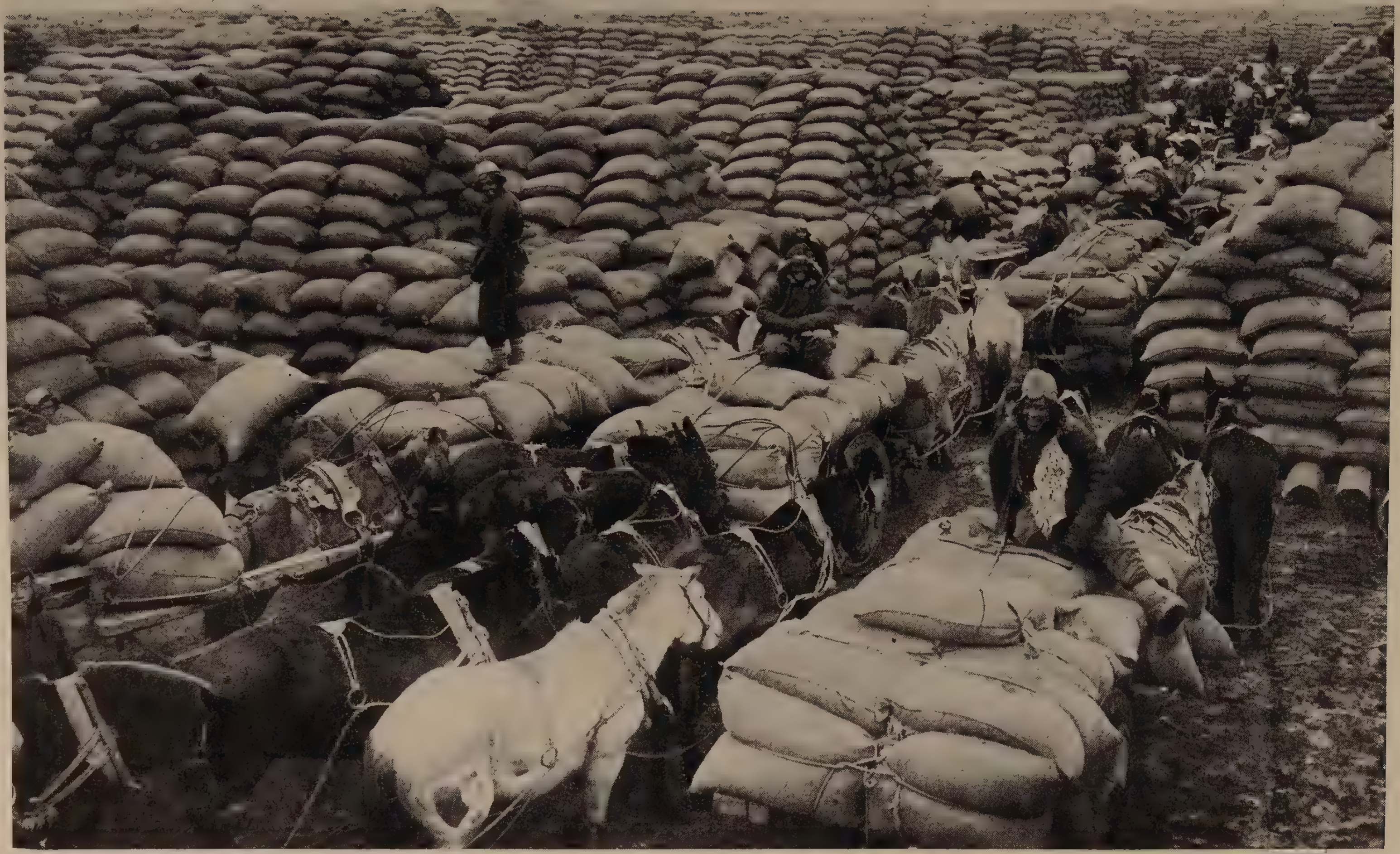
As food for man and beast, as fertilizer, and as raw material for industry, the soy bean, in its rapid rise to international importance within the last 20 years, has made an agricultural epic. A trainload of soy-bean cakes at Dairen.



Photograph courtesy South Manchuria Railway

NOW PEACEFUL PILGRIMS HALT THEIR CARTS WHERE KUROPATKIN CAMPED

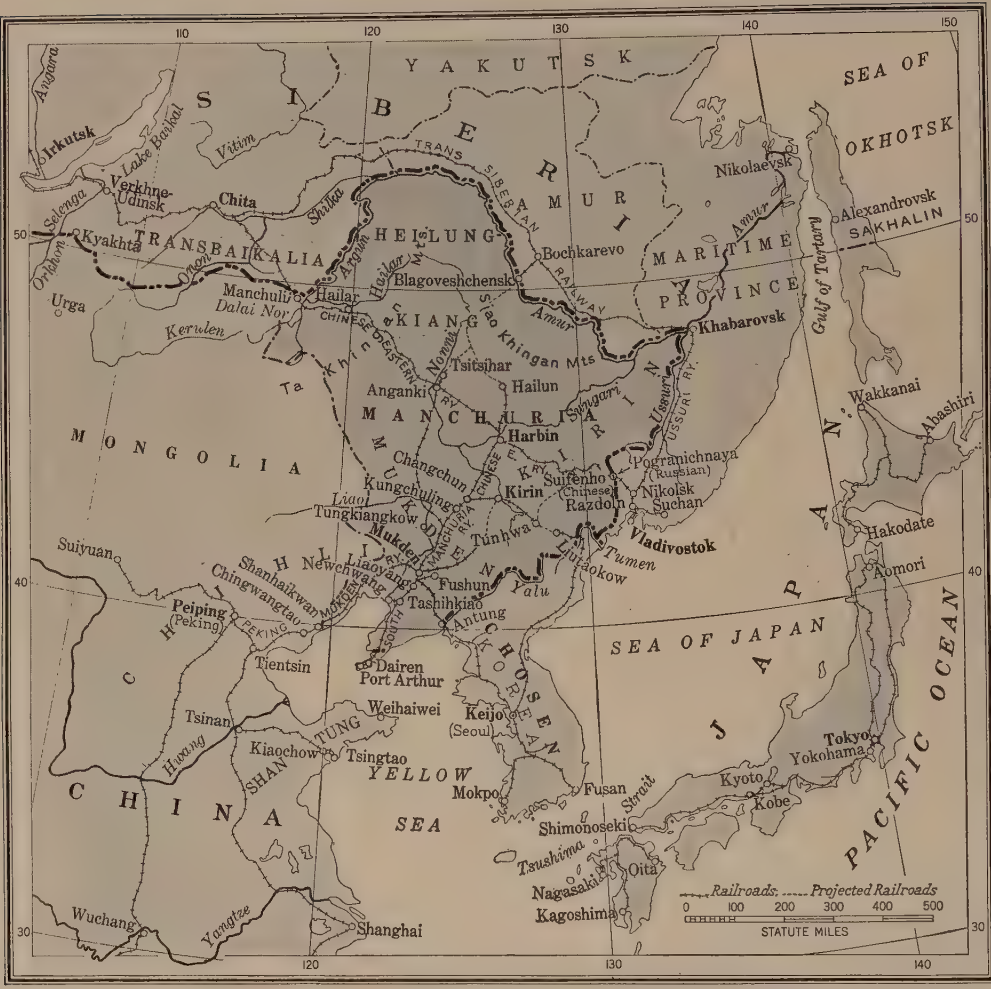
In April of each year (by the Chinese calendar) thousands of visitors flock to the Shrine of the Sisters at Tashihkiao, on the Liaotung Peninsula, historic battleground of the Russo-Japanese War. The fair, held at this time, is more of a drawing card, however, than the ancient shrine.



Photograph from Ewing Galloway

BY SOY BEANS ALONE MANCHURIA COULD LIVE AND SUPPLY THE WORLD

For 5,000 years the Chinese have eaten this important crop, but Europe and America did not wake up to its value until recent times. Now Manchuria produces nearly three-fourths of China's entire output, and the growth of the industry there has attracted thousands of Chinese, chiefly from Chihli and Shantung. Bags of beans in a shipping yard near Dairen.



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YAKUTSK
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Verkhne-Udinsk
Chita
Shilka
TRANS SIBERIAN
AMUR
Nikolaevsk
Amur
Alexandrovsk
SAKHALIN
Kyakhta
TRANSBAIKALIA
Orkhon
Onon
Argun
HEILUNG
Hailar
Bochkarevo
MARITIME PROVINCE
Gulf of Tartary
Urga
Manchuli
Dalai Nor
Hailar
Blagoveshchensk
CHINESE EASTERN
KIANG
Siao Khingan Mts
RAILWAY
Amur
Khabarovsk
Kerulen
Ta Khingan
Nonni
Tsitsihar
Hailun
Anganki
RY.
Sungari
Ussuri
USSURI RY.
Wakkanai
Abashiri
MONGOLIA
MANCHURIA
Harbin
KIRIN
Pogranichnaya (Russian)
Changchun
Suifenho (Chinese)
Nikolsk
Kungchuling
Kirin
Razdoln
Suchan
Liao
Tungkiangkow
MUKDEN
CHINESE RY.
SOUTH MANCHURIA RY.
Tunhwa
Vladivostok
Hakodate
Suiyuan
Mukden
Shanhaikwan
Chingwangtao
Newchwang
Liaoyang
Tumen
Aomori
40
Peiping (Peking)
PEKING
Fushun
Yalu
Tashihkiao
Antung
Liaotung
CHOSEN
SEA OF JAPAN
JAPAN
OCEAN
Tientsin
Dairen
Port Arthur
KOREA
Weihaiwei
Keijo (Seoul)
Tsinan
SHANTUNG
Hwang
Kiaochow
Tsingtao
YELLOW SEA
Tokyo
Yokohama
Kyoto
Kobe
PACIFIC
CHINA
Mokpo
Fusan
Strait
Shimonoseki
Tsushima
Oita
Nagasaki
Kagoshima
Railroads
Projected Railroads
0 100 200 300 400 500
STATUTE MILES
Wuchang
Yangtze
Shanghai
30

Drawn by C. E. Riddiford

MANCHURIA IS LARGER THAN FRANCE AND THE BRITISH ISLES COMBINED

Two large mountain ranges, with fertile valleys between them, traverse the Land of the Manchus from north to south. The northern section of the "Three Eastern Provinces" (Heilungkiang, Kirin, and Mukden), as the Chinese call the country, is better wooded, but the southern is more fertile and contains twice as many people. Manchuria lies practically within the same degrees of latitude as parts of Spain, England, and Germany, but its winters are long and severe, its summers short and hot, with terrific winds, the "Yellow Dust" of the Chinese, sweeping in from the Mongolian plain in spring.

Ussuri River to the Sea of Japan and comprising an area as big as Mexico. Across this domain, in the 1890's, she was pushing her great Trans-Siberian Railway to strike the sea at Vladivostok. But, as the map shows (see above), the original Siberian road, to reach Vladivostok over Russian territory, had to run a roundabout course along the Amur Valley and via Khabarovsk.

Six hundred miles would be saved if the Russians could build directly from Chita, on the Siberian road, straight southeast across Manchuria to rejoin the Trans-Siberian system near Pogranichnaya, on the way to Vladivostok.

On the heels, then, of her friendly gesture in 1895, when Russia aided China to regain the area lost to Japan at Shimonoseki, the Bear asked the Dragon for the right to build a railway across Manchuria; and, by agreement signed September 8, 1896, that concession was granted. From it dates the rise of modern Manchuria.

Pacific and Atlantic Photograph

MORE RAILWAY CONSTRUCTION IS UNDER WAY IN MANCHURIA NOW THAN IN ANY OTHER PART OF THE WORLD

Two systems, the South Manchuria and the Chinese Eastern, with the English-financed Peking-Mukden track, form the heavy lines in the railway net; but many new connecting roads are being built. While Chinese own and control the new lines, capital is most often supplied by the Japanese, who also do the construction work. To prevent erosion, tufts of grass have been planted along this embankment.

That line and that original branch of it, now called the South Manchuria Railway, with the economic rights they carried, were to do for Manchuria what the Union Pacific did for the American West. Like magic, these new railways were to turn a wild, thinly peopled nomad land into a modern Canaan, a granary of the East, drawing new settlers at the rate of anywhere from 300,000 to 1,500,000 in a single year.

AGAIN AND AGAIN, MANCHURIA MAKES FRONT-PAGE NEWS

Because of its conspicuous importance and its vast influence on migration, industry, and agriculture, it is worth while to review the development of this railway and of its extension, the South Manchuria Railway.

All over the civilized world, newspaper readers know this famous line now as the Chinese Eastern Railway. By the terms of the original agreement, signed between China and the Russo-Chinese Bank (later the Russo-Asiatic Bank), it was to be a joint enterprise. The Tsar's engineers built it and Russians had charge of its shops, maintenance, and technical operations; but Chinese were supposed to share equally with Russian directors in its general management. When completed, in June, 1903, it had cost in excess of $200,000,000. Of this cost, China supplied about $5,000,000 and shared, proportionately, in its profits.

When finished, the main line of the Chinese Eastern ran from its terminus at Manchuli, on the northwest border of Manchuria, to Pogranichnaya, on the eastern boundary. From Harbin, now a busy, important city and then a mere fishing village on the Sungari River, a branch line was dropped south to Dalny, now Dairen, on the Bay of Korea. Most of this section, or that part from Changchun south to Dairen, is now known as the South Manchuria Railway.

Photograph by Maynard Owen Williams

HARBIN IS TO-DAY THE FLOUR-MILLING CENTER OF MANCHURIA

Contrary to popular belief, many millions of Chinese eat no rice, but live on millet, wheat, and other grains. Modern American mill machinery is used here, and the growth of Harbin's flour trade has caused it to be styled the Minneapolis of Manchuria.

Dalny was literally a magic city. Built quickly, by imperial command, it was the talk of the Far East. On this barren, then empty, point of rocks, I saw engineers, architects, and workers of the Tsar spending millions of rubles to build wharves, streets, business blocks, and houses for a population yet to come. A magnificent vision, that—the vision of a great seaport, terminus of a 5,495-mile railway tying Europe to the Orient.

How we laughed, in our youth, at this amazing spectacle — trainloads of tools, food, tents, work animals, scrapers, and building material being dumped on a rocky shore of faraway Asia to build a city where there were no people! Yet today Dalny, Dairen, is the second or third most important seaport on all the China coast! In Manchuria something is always happening!

It happened again in 1904, when Japan fought Russia. We saw the holes in the armored sides of escaping Russian battleships — holes big enough to lead cows through, holes made by Togo's guns in Tsushima Strait. Port Arthur, the impregnable, fell; ancient Mukden echoed and shook under the heaviest gunfire Asia had ever known.

Kuropatkin lost—and President Roosevelt mediated. In the peace conference at Portsmouth, New Hampshire, Russia ceded to Japan her lease on the Liaotung Peninsula and possession of the South Manchuria Railway as far north as Changchun. China confirmed this and later extended Japan's lease for a period of 99 years.

THE WORLD WAR BRINGS WHITE SETTLERS FROM RUSSIA

But in Manchuria drama never dies. Tragedy, stark and terrible, stalked across the East when Imperial Russia collapsed. Refugees by the thousands, fleeing the horrors of postwar political chaos in Siberia, came east to beg, borrow, or starve in neutral Manchurian towns. Of them, more later (see text, page 399).

In this chaos the Allies took over the operation of the Chinese Eastern Railway.

Photograph courtesy South Manchuria Railway

IN THREE DECADES THE FISHING VILLAGE OF DAIREN HAS BECOME ONE OF THE WORLD'S BUSIEST PORTS

Miraculously created almost overnight by Russian imperial order, Dalny (now Dairen), first designed as the Pacific open-water terminus of the great Trans-Siberian system, now challenges Shanghai. It is the phenomenal growth of traffic over the South Manchuria Railway, as the new country develops, which makes this the second or third seaport in all China.

From their base at Vladivostok they needed it to move men and supplies. An American engineer, famous for his work on the Panama Canal, was in charge. Later, the newly formed Soviet Government took Imperial Russia's old place as partner with the Chinese. In 1924, by a new treaty, China enjoyed an equal share with the Soviets in the profits of the railway. It was agreed, too, that China should govern the railway zone, inhabited now by many thousands of whites, and that each nation in the compact should refrain from propaganda against the other's social and political systems.

That, stripped of details, is the brief story of the now famous Chinese Eastern Railway up to June 11, 1929, when it was seized by the Chinese, its Russian personnel arrested, causing clouds of war once more to loom over this stage of so many historic struggles.

Immigration, tremendous almost beyond belief, is the other aspect of swift transition in this land of amazing growth.

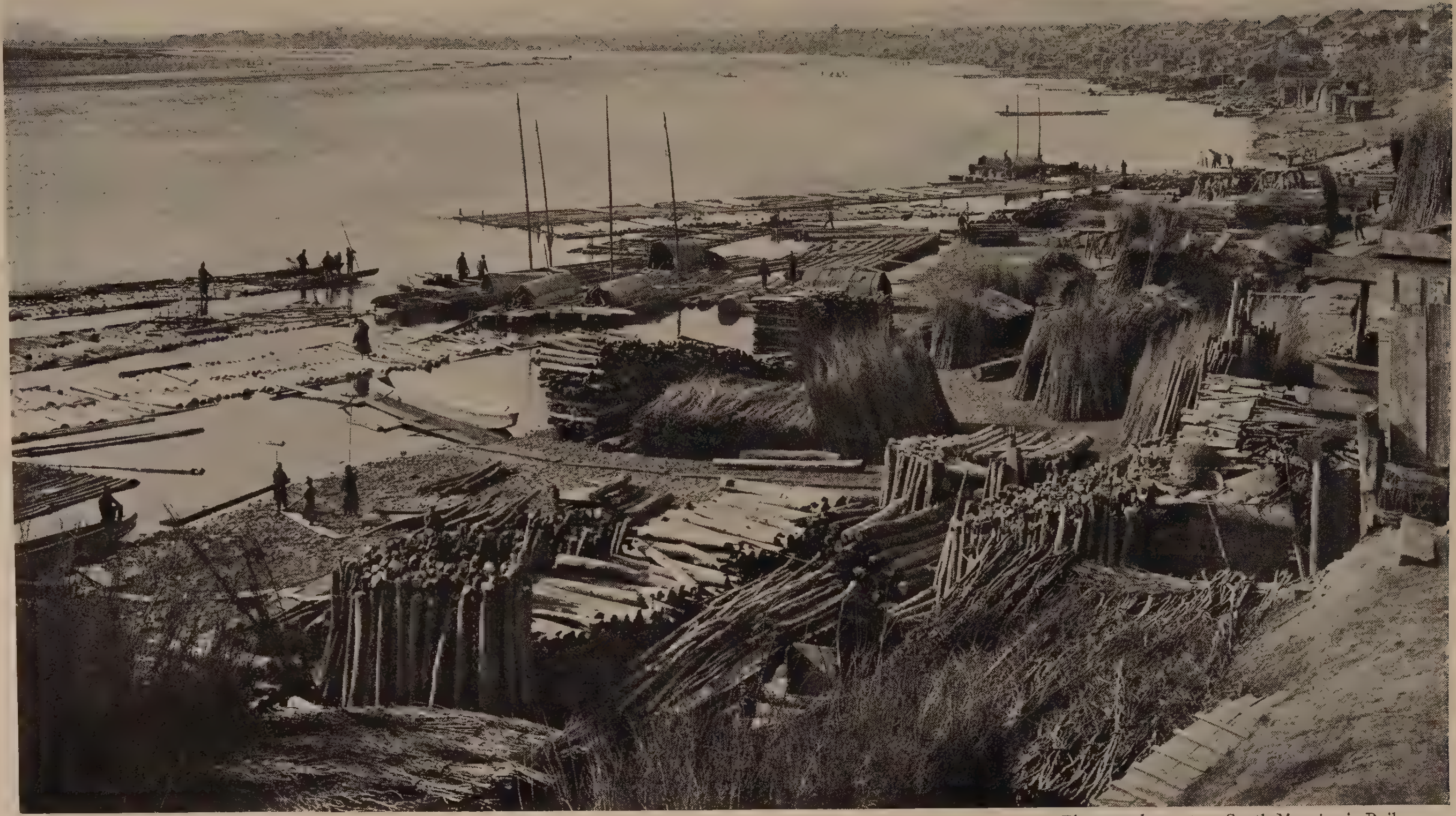
A million five hundred thousand Chinese, it is estimated, now migrate to Manchuria each year. They come mostly from the bandit-ridden, famine-swept provinces of Chihli and Shantung. When the first railway crept in from Siberia, population in Manchuria was scant; away from the coast and scattered cities, most of the people lived as herdsmen, hunters, and robbers. To-day perhaps 30,000,000 are settled there, plowing virgin soil up to the very frontiers of Siberia, and even encroaching so steadily into Mongolia that no one seems to know just where Manchuria quits and Mongolia begins.

To-day North Manchuria is to China what the Middle West was to America in the decade before the Civil War, with this exception: our older Atlantic Coast States yielded only a share of those who settled our West; many others came from Europe.

Manchuria, a part of North China, lies near the most thickly peopled and hungry country on earth. But for its turbulent

Photograph courtesy South Manchuria Railway

SQUARE-SAILED JUNKS OF DAIREN BAY LOOM AGAINST THE EASTERN SKY



Photograph courtesy South Manchuria Railway

SLIPPING DOWN THE YALU, LUMBER RAFTS FIND A HARBOR AT ANTUNG

Every year between 3,000 and 7,000 rafts are floated down from the upper reaches of this river to the busy port near its mouth. Chinese lumberjacks go to the forests in October or November, cut timber during the winter months, and later lash the logs into rafts for the rising waters of spring and summer to bear away. The Yalu forms part of the boundary between Manchuria and Chosen (Korea) and is one of the great transportation arteries

Photograph courtesy South Manchuria Railway

A CRACK FLYER TO CHINA'S LAND OF PROMISE

Not in Pullmans or day coaches of such luxurious trains as this does the present-day Chinese immigrant travel to his new home. He boards an open box car, if he is lucky enough to have a ticket, for which he may have sold his daughters to get the money. The others must struggle along as best they can on foot, the women with the babies and the men carrying the sick and the aged. The South Manchuria Railway depot at Kungchuling, an important grain market and site of an agricultural experiment station.

Tatar tribes, who were always fighting, either against the Chinese or among themselves, until railways came, millions of Chinese probably would have migrated there long ago. Also, during the long régime of the Manchus at Peking, the latter wilfully restrained their Chinese subjects from venturing north of the Great Wall. A warlike people themselves, they sought to retain the martial spirit of their kinsmen in Manchuria; so they passed stern laws against Chinese migration, that they might not "contaminate" Manchuria with a passion for learning and agriculture.

HOW THE MILLIONS ARE MIGRATING TO MANCHURIA

However, even before the Taiping Rebellion, in the last century, the Manchu dynasty, with its famous Bannermen at Peking, had softened after years of easy life in the capital. As authority relaxed, more Chinese began to move to Manchuria, to whose Yalu Valley a trickle of migration had gone on for generations, in spite of regulations.

But the present far-reaching, enormous migration began only in recent years.

I saw it getting under way, after the Boxer War, when Russian soldiers occupied Manchuria. Many coolies went then, to work on railway construction and in building the new towns, bridges, and barracks. Too poor to ride, I saw them, carrying their bundles, trekking north, between Shanhaikwan and Newchwang, like a stream of ants crossing a pavement. Hungry, footsore, cold, they pressed on with that grim, fatalistic patience peculiar to them.

This dismal picture came to mind again, years later, when I saw hordes of ragged, famished peons fleeing from revolution in Mexico, arriving half-naked and exhausted at Arizona and Texas border towns. Probably the Israelites reached the Promised Land in much the same plight.

Photograph by Maynard Owen Williams

PUZZLE: FIND THE DONKEY!

A Chinese teamster at Mukden, his donkey almost hidden by long timbers. In Manchuria, as in America, forests have been wasted and lumber becomes more scarce as additional lands are cleared for farming.

Russia then used to send ships to North China ports to recruit labor. On one such coolie ship, loaded and already cast off for Port Arthur, a riot broke out. Rumor had spread that the coolies, instead of being taken as laborers, were to be impressed into the army. To quell the disorder, ringleaders were lashed to the ship's rail by their own pigtails. Many jumped overboard, pulling out their hair, since it was tied fast, and we saw some drown as they swam for shore.

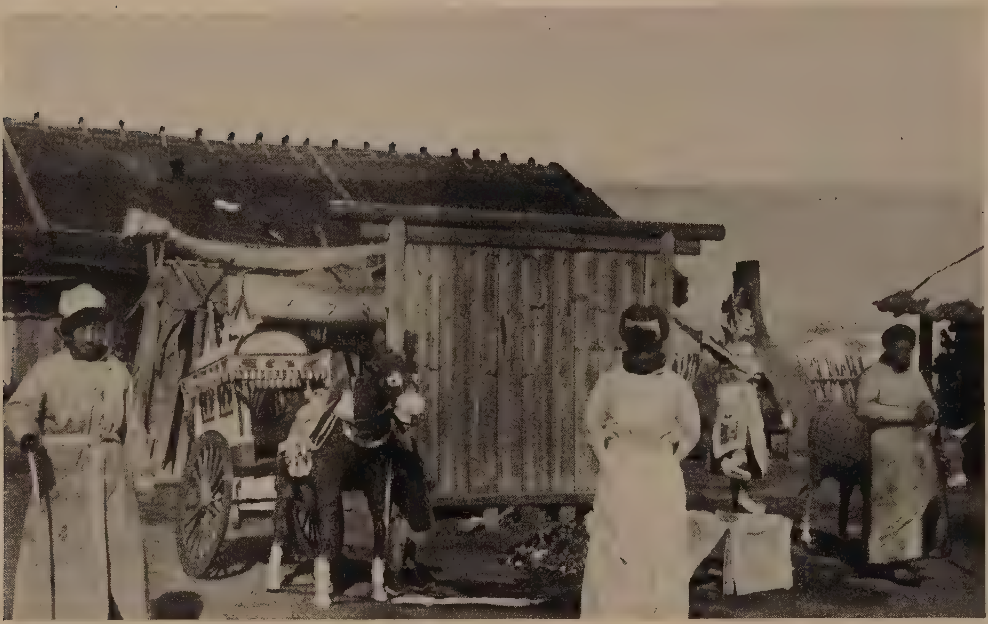
Men alone moved to Manchuria when the trek first started, and often they remained only for a season's work, as do many of the Mexican peons who enter our Southwest each spring. As late as 1925, few women went and no old people. Now whole families join the march, a coolie often carrying his helpless old father on his back.

In this year of 1929 alone, it is estimated, 2,000,000 Chinese are moving to Manchuria!

Carrying babies, pots, pans, and a small bundle of ragged clothes, sometimes chewing grass and even weeds for nourishment, like an army of crawling bugs, these pilgrims swarm out of China. Some go by railway flat cars through the old gap in the Great Wall at Shanhaikwan, others by junk or steamer, from Tientsin or Tsingtao (see pages 409, 410, and 411).

The fare is only a dollar from Tsingtao to Dairen, yet so many thousands ride that this coolie passenger trade is a bonanza to Japanese steamers. Fifteen hundred or two thousand may ride on one small steamer, packed so tight that there isn't room to lie down on deck. Short as the run is, boats get so filthy that, after the coolies are landed, Japanese workers wear masks and use fire hose and scrapers to clean the ship.

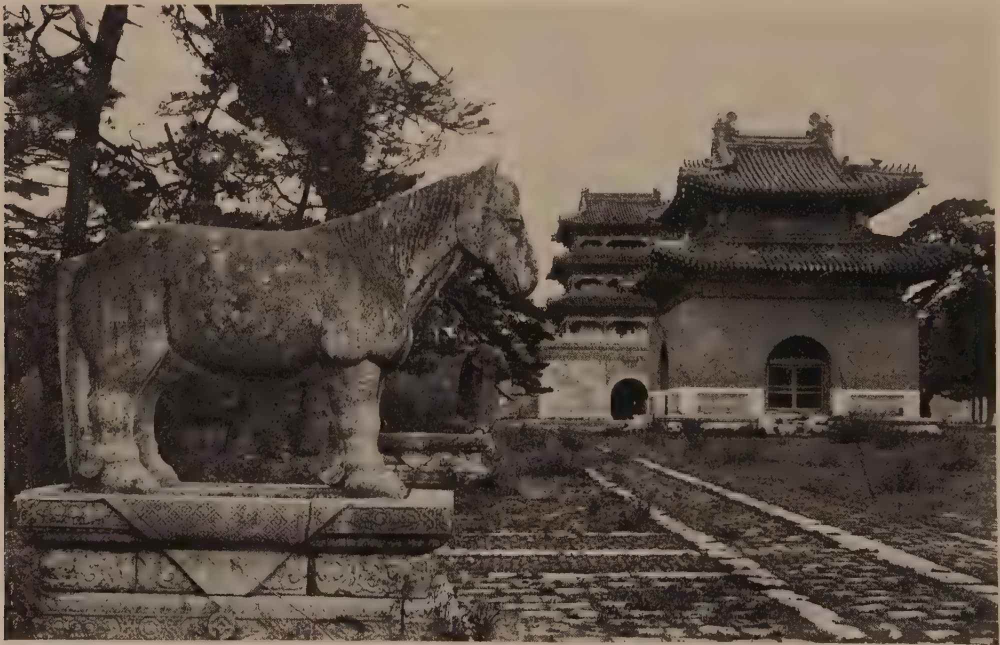
Already South Manchuria is fairly well settled. So the tide now flows through Harbin to regions beyond, there hastily to build mud-and-wattle huts, plow, and plant beans. To aid immigrants whom the railroads want, low fares are granted on the Chinese Eastern; children and old people are hauled free. Once these new



Photograph by Hugh A. Moran

FOOLING THE DEVIL

Horse, cart, and ox are made of paper for burning at Chinese funerals. The ruler of the nether world will think that the real cart and animals have been sacrificed and will provide their spirits to serve that of the dead.



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MUKDEN, LIKE PEKING, AFFORDS EXAMPLES OF EARLY CHINESE ARCHITECTURE

For centuries Chinese architects have been idle. In times past they produced great works of singular beauty. Old double-walled Mukden, with its palace, drum and bell towers, and outer parks with tombs of Manchu leaders, is the capital of Manchuria. In the Peiling, or north mausoleum, with its approach of stone animals, rests Taitsung, who in 1636 first applied the name Manchuria to the Land of the Manchus.

© E. M. Newman

HERE THE SIGN OF THE EAGLE AND ARROWS GIVES THE YANKEE A WARMING TOUCH OF HOME

The American Consulate at Mukden occupies an old temple in the foreign settlement. At this outpost of trade Uncle Sam's representative handles business pertaining to imports of American machinery, tobacco, construction materials, and other products which Manchuria wants from the United States in return for its own soy-bean oil, bean cake, and especially rich furs—sable, dog, squirrel, and fox tails—which come from the northern borders.

railways hauled hardly any freight at all—only nonpaying soldiers. Now long cargo trains creak across the plains, for the soy-bean crop alone has grown from an indifferent product when the road was surveyed to something like 5,500,000 tons a year (see, also, text, page 413).

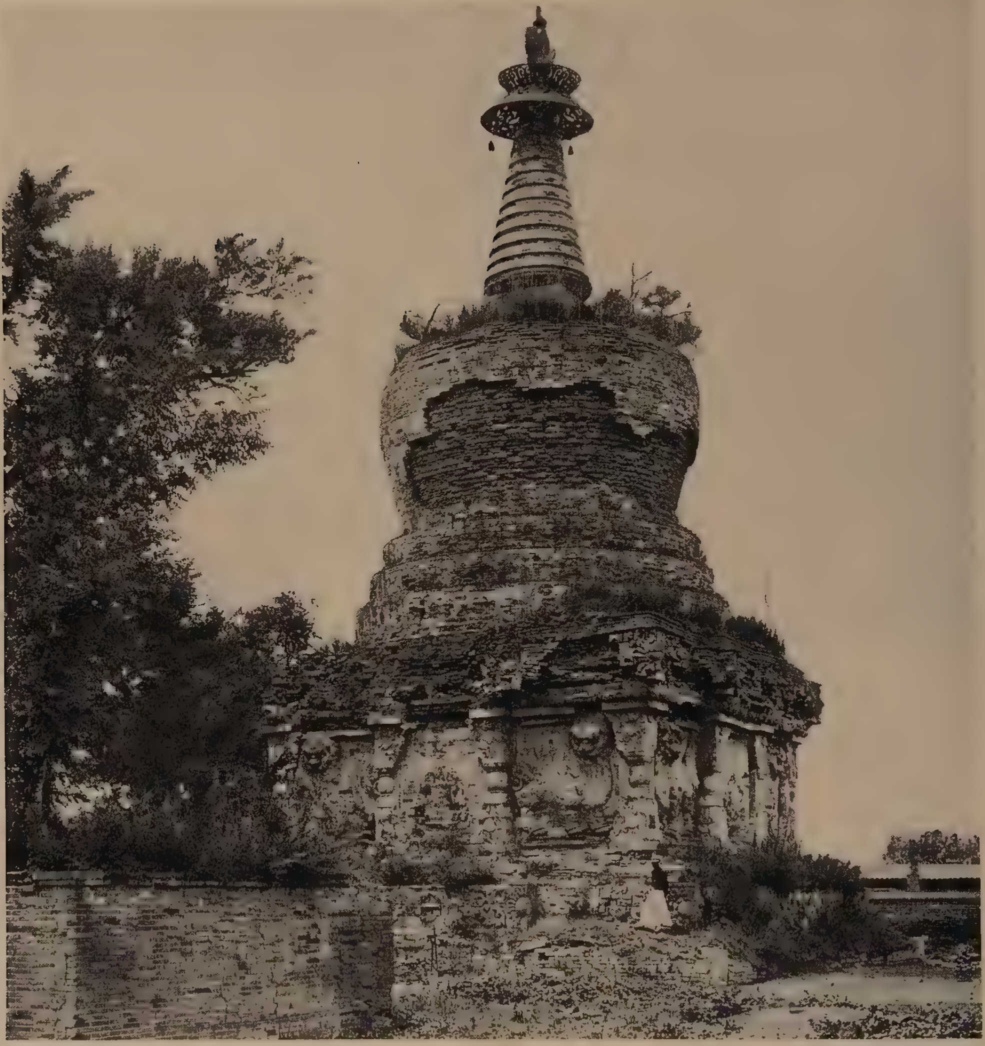
THE "WILD WEST OF THE FAR EAST"

In shape Manchuria is roughly a big triangle, its base on the Amur, to the north. On the south its apex splits the Gulf of Chihli from the Yellow Sea. Chosen (Korea) and a bit of the old Russian Maritime Province bound it on the east. To the west lies the somewhat movable border line of eastern Inner Mongolia and a ruined part of the Great Wall of China.

Nobody has ever surveyed Manchuria as a whole, but guesses place its area at 363,000 to 380,000 square miles, roughly half as big as Mexico; yet its population is already four times as dense. In 100 years Mexico's population has multiplied no more than four times; in 30 years Manchuria's has multiplied probably six or eight times.

It lies in the same latitude as the land from Cincinnati to Hudson Bay. Naples, Berlin, and London are in the same zone. Its climate is the dismay of weather prophets. On the plains its summers may be as hot as those of Kansas or Missouri; yet winter may see the thermometer 20 to 60 degrees below zero. Often high, cold winds whistle down from the Mongolian deserts, just as northwesters freeze the cattle of our West.

One winter at Newchwang, I saw the U. S. S. *Vicksburg* frozen in at her river moorings. Her crew had draped her decks with straw mats. On these snow had drifted, leaving her masts and funnels sticking through, thus suggesting a polar expedition wintering among the ice fields. Ice on the Liao was two or three feet thick then, and we traveled over it in



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AGE AND DECAY CLAIM A NOBLE MONUMENT AT MUKDEN

The crumbling lama tower was built centuries ago, when temple-raising was a favorite occupation of kings and emperors. Three others, similar to it, stand about the city. Lamaism flourishes in Mukden, but perhaps a third of her people are Moslems and their influence is strong.

Chinese sleds equipped with sails—crude iceboats. Crossing from Chingwangtao to Weihaiwei, when the spring thaw had started this river ice out to sea, we plowed through vast fields of it. In North Manchuria the Amur and Sungari rivers freeze up in November and are not open for boats till the middle of April.

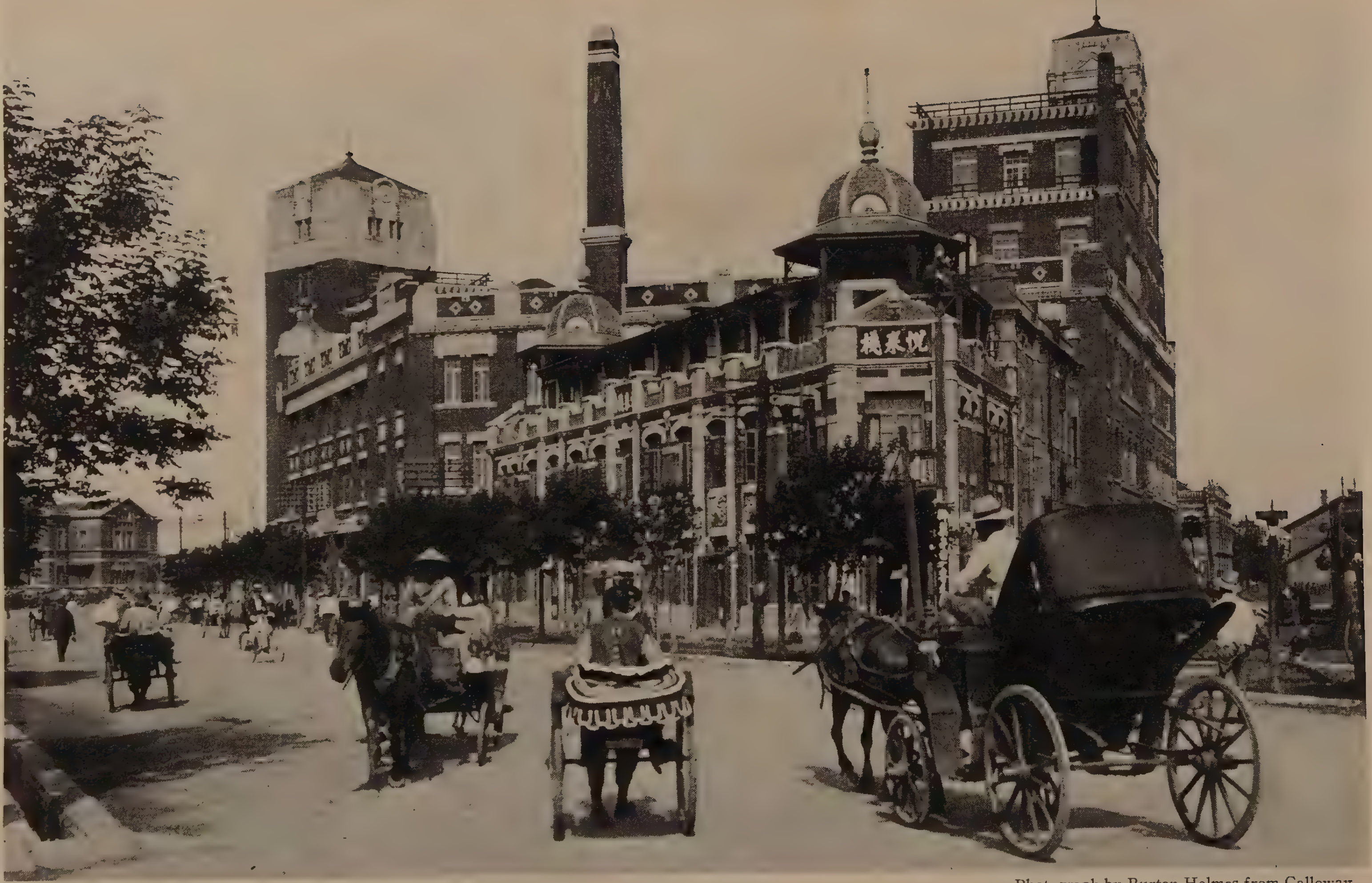
Literally, thousands of small Chinese sailing craft, used mostly for carrying soy beans, crowd the Liao River. I saw a fleet of more than 6,000 laid up at Newchwang at one time. And its valley is amazingly productive. It is a baby Nile or Mississippi of southern Manchuria—by far the richest and most densely settled of all Manchuria's five major river basins. A third of all the vast Mukden Province lies in this Liao basin (see map, page 384).

Farms stretch away, as far as one can see, over the level plains south of Tungkiangkow; but farmhouses do not stand on each farm. Here, as in North China, they cluster in groups, surrounded by high mud

Photograph courtesy U. S. Department of Agriculture

THE CHINESE DISPLACED THE MANCHUS IN MANCHURIA

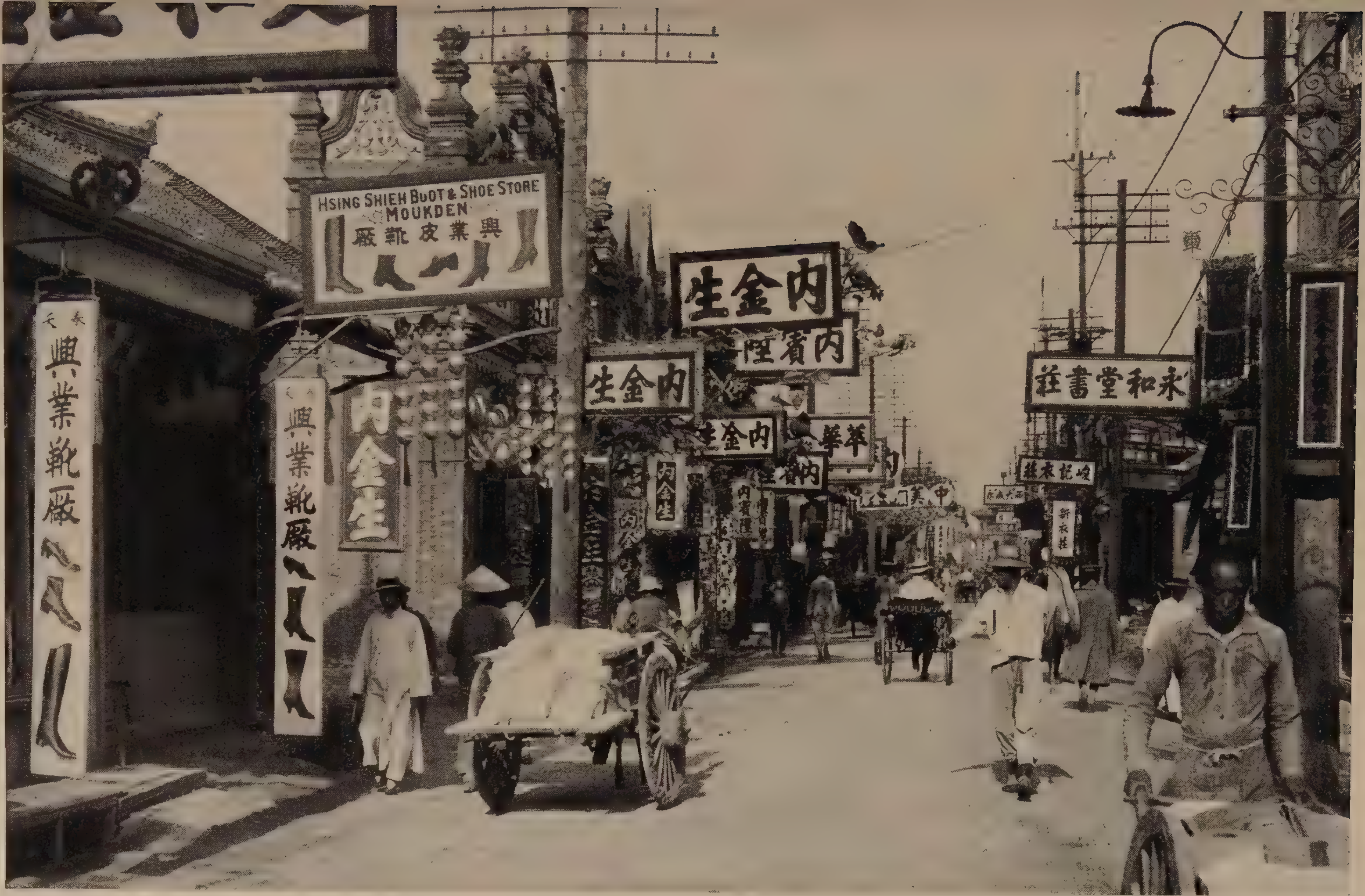
Centuries ago the Manchus drove Chinese immigrants from southern Manchuria back to their native provinces; to-day the process has been reversed, only a tenth of the country's population being Manchu. Before 1926 half the immigrants were seasonal laborers on farms and railways, who returned to their homes in the autumn; now most of them, with their families and household goods, come to stay.



Photograph by Burton Holmes from Galloway

OUTSIDE THE ANCIENT WALLED CITY OF MUKDEN MODERN SETTLEMENTS HAVE SPRUNG UP

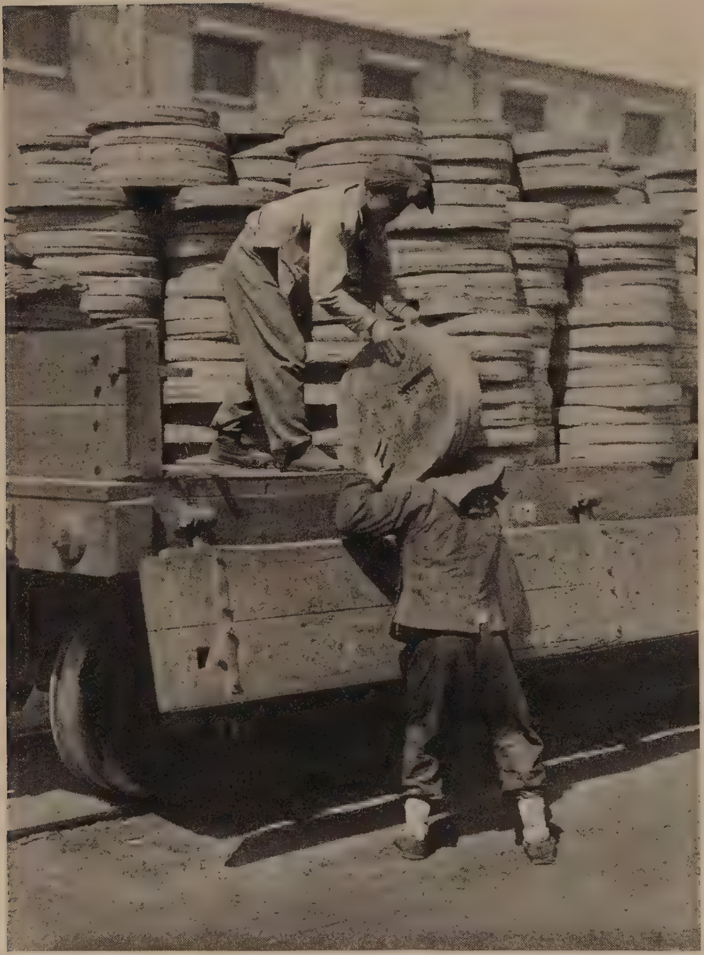
Railway activities center in the new Japanese quarter. Between it and the old walled Manchu capital lies the International Settlement, with its many foreign consulates. In recent years scores of highly modernized homes, warehouses, and office buildings have been erected in this new Mukden, which is in striking contrast to the old (see opposite page).


HSING SHIEH BOOT & SHOE STORE
MOUKDEN
興業皮靴廠
內金生
內賓陞
永和堂書莊
興業靴廠

Photograph by Holmes from Galloway

MUKDEN GAVE TO CHINA AN IMPERIAL LINE OF RULERS

China's first Manchu emperor moved his capital in 1644 from here to Peking (recently rechristened Peiping), where the "Great Pure Dynasty" ruled for 268 years, until China became a republic, in 1912. The teeming streets are lined with carved and gilded shop fronts



Photograph courtesy South Manchuria Railway

UNLOADING CAKES OF THE "MODERN MANNA" AT DAIREN

All the world looks to this busy port and gateway of Manchuria for the greater part of its soy beans and bean oil. Besides its various other uses in the East, in America and in Europe, Italy now consumes soy-bean flour in bread and, to some extent, in macaroni.

walls for protection against the Hunghutze, or ever-active robber bands.

Except when frozen over, the roads here are nothing but ditches of mud or dust. Happily, however, the South Manchuria Railway serves the eastern section of the plain, and part of its west is in the territory of the Peking-Mukden Railway.

MANCHURIA IS A LAND OF MANY RIVERS

To Americans the Yalu is one of the best-known of all Far Eastern rivers because of the dramatic manner in which Kuroki's army crossed it in that great war with Russia, when, for the first time in modern history, a yellow nation faced a white in a supreme test of men, steel, and high explosives. This great stream, with the Tumen, divides Manchuria from Chosen. The Tumen and the Yalu rise in the same range of mountains. The former flows north and east into the Sea of Japan; the latter roars down to the Yellow Sea. At Antung, over one of the greatest bridges in all Asia, runs the railway from Chosen and the rushing Seoul-Mukden Express.

Scenery here is not unlike the Hudson at the north tip of Manhattan. Smoke belches from the tall stacks of paper, iron, and lumber mills. Batwing junks dot the river, and downstream, after the spring thaws, come huge rafts of logs, on each of which is a hut, where the logger lives during the weeks it takes him to float down. Often he loads a patch of dirt on his raft, also, and there grows spring vegetables to eat on the trip (see pp. 389, 409).

Bustling Antung, with its American and other foreign traders, its "new town" (risen like magic since Kuroki's day), its mills and many joint enterprises between Chinese and Japanese business men, is symbolic of the new Manchuria.

The Ohio, the Mississippi, the Missouri, and Columbia were river valleys which lured Americans when their country was young. It is so in Manchuria; development follows the streams. And the Amur, curving around the country's north frontier, has also played a big rôle in its history.

Pacific and Atlantic Photograph

THE SPACIOUS PLAZA OF DAIREN, MANCHURIA, WITH THE YAMATO HOTEL IN THE BACKGROUND

Laid out like Washington, D. C., the wide avenues radiate from this parked municipal center like spokes in a wheel. Through Dairen, Chinese immigrants coming by boat from Tsingtao and other ports enter Manchuria at the rate of 12,000 a day. This city, which sprang up like a mushroom (see page 386), is the terminus of the Europe-to-Asia railway line.

The weariest river must some time touch the sea. After 2,500 miles the toiling Amur comes to rest in the Gulf of Tartary. To its banks blonde Russians came, away back in 1689, to make a treaty with China—her first with any white power. In time myriad Cossacks draped the river's wooded bends, and the shadow of the Muscovite eagle fell on all that vast country beyond the Black Dragon, as Chinese term the Amur.

For 2,000 miles this mighty stream is navigable; but, as I write this, Chinese boats never touch the Russian side, and Soviet craft load and unload only on its north bank. War made neighbors of coolie and muzhik, but time has yet to make them brothers.

On its majestic, winding way the Amur is met by the Sungari, another useful river of Manchuria, with a boat and barge traffic similar to that of our own Mississippi. In Manchu, Sungari means River of Heaven. It waters the plains of Kirin Province and serves the gay, turbulent new city of Harbin, Minneapolis of Manchuria, with many flour mills (page 386).

NOW THE WHITE AND YELLOW RACES ARE NEIGHBORS IN ASIA

Harbin is a "case." To social and political psychiatrists it is a curious study, full of implications and connotations. Harbin, like Angora, again stamps the adjective "changeless" as a bogus modifier of the noun "East"; for now the yellow man rules over the white at Harbin; whites work for yellows; and there is even a charity home for Russo-Chinese children, which hints at the beginning of racial amalgamation.

The wreck of society in Russia, the poverty of survivors who fled to Manchuria, and the surrender of police and courts in the railway zone to Chinese brought about this new alignment. True, it is local and affects only 120,000 or more whites; but it is strangely significant; for

Photograph by Leonid Dalevitch

"ONLY OBSERVE ETIQUETTE, AND THE TENT IS YOURS"

Even among the rough-and-ready nomads of the Manchurian frontier, there are a few essential rules of politeness. After a visitor greets his host of the yurt, the usual thing to do is to exchange snuff bottles.

nowhere in all the East—since the early days of Treaty Ports and extraterritorial privileges—have yellow men ever ruled over whites, with the power of arrest and punishment.

And in the East news travels fast, as fast as wireless. Cairo bazaars knew of Chinese Gordon's death at Khartoum before it was officially reported.

In Manchuria, not so long ago, no white man of dignity would be seen carrying even a package of books through the street, lest he lose caste in native eyes.

This was not snobbish; it was wise. It inspired native respect in a land of sharp social distinctions. Chinese share not at all in Western democratic philosophy of the "dignity of labor." Wherever he can, the Chinese saves enough money to avoid working with his hands; he sees dignity primarily in an easy life, reading the classics. In his lighter moods he feeds his tame larks by flipping grain into the air for them to catch as they sing, fights crickets, fans, smokes and drinks with friends where the *sing-song* girls are gayest. Or maybe he's a pigeon fancier and makes little æolian harps of bamboo reeds and ties them under their tails, so the harps play when the birds circle overhead.

Anyway, the traveler who knows the East is amazed now when white men storm the train at Harbin or Mukden to grab his bags, and he sees white men sweeping the streets or subject to the orders of Chinese policemen.

Like Houston or Seattle, Harbin fairly leaped into urban life. When Russian railroad builders came, only one house stood where now rises this gay, colorful, pulsating Moscow of the Far East. It is the only city in all Asia which has nearly as many whites as natives.

RAILWAYS REVIVE A LONG SOMNOLENT LAND

The story of Harbin is the story of what Russia did for the Chinese—opened up a new empire and gave homes to millions. In building the Chinese Eastern, observed Kuropatkin, the equivalent of $150,000,000 went from the pockets of

Photograph courtesy U. S. Department of Agriculture

SOUTHERN MANCHURIA MAY BECOME A CALIFORNIA OF ASIA

Climate is favorable. Apples, pears, peaches, and other fruit crops are increasing in this region, which seems destined to become a Far Eastern fruit belt. Cultivated grapes are one of the prize fruits with the Chinese, but these are a wild variety from mountains near Harbin.

Russian peasants into the hands of Chinese coolie workers.

Track-laying started from Harbin in three directions at once—toward Chita, Vladivostok, and Port Arthur. To bring in rails, ties, tools, and supplies from Siberia and Japan, the Russians fairly covered the Amur and Sungari with steamers and barges. No such hectic activity had ever been seen anywhere in Asia. From Khabarovsk to Harbin there came and went a steady line of craft laden with steel, dredges, road-making machines, food, and clothing.

It was this golden flood from the Tsar's money boxes which first moved Manchuria on its almost miraculous path to progress. When, in the Boxer and Japanese wars, still more booted Slavs came scattering money as armies do, more financial fuel was added to the economic flames. So, from its very youth, Harbin was a marvel. Like magic it grew from a cluster of engineers' tents to a wonder city of stately avenues, bean oil and flour mills, fur traders, importers, fine buildings of brick and stone, hotels, theaters, and *cafés chantants.*

Standing on the Sungari, where the railway from South Manchuria joins the Chinese Eastern, midway between Chita, in Transbaikalia, and Vladivostok, on the Sea of Japan, Harbin is the natural center of a vast trade area. It lost some pomp and glory when Imperial Russia fell, but it continues to gain in economic and industrial solidity.

Many American firms, as well as Russian, Japanese, and Chinese, are established here, and Harbin is curiously cosmopolitan. It is the commercial center for the two Manchu provinces of Kirin and Heilungkiang and a part of Inner Mongolia. Siberia, as far west as Irkutsk, once traded heavily with Harbin; but since the Soviets put all foreign trade in the hands of Government agencies this has languished.

Although Chinese is the common language of Manchuria, Russian is rather the language of trade, and many Chinese have learned it. They must, to do business,

Photograph from M. Bernstein and Sons

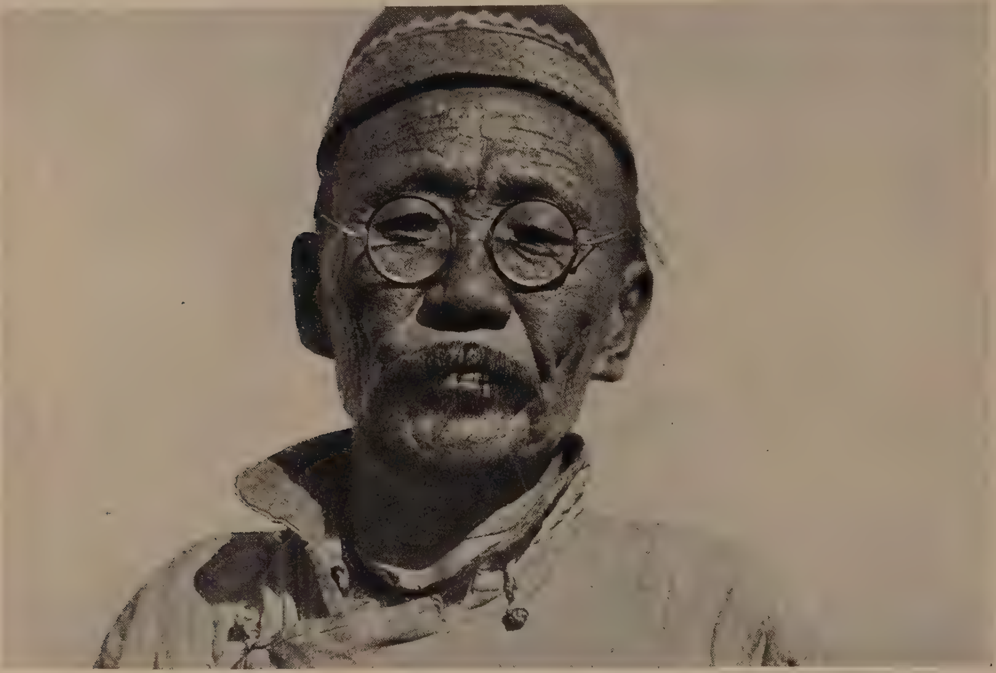
HERE DOG AND GOAT SKINS ARE MADE INTO THE "MATS" AND "ROBES" OF TRADE

From China we buy more furs than from any other source. Dog and goat skins form the chief items. After the animals are slain and skinned, their dried and frozen pelts are shipped to local fur markets for treatment, as in this Mukden compound. From Korea come some dogskins, but those from Mongolia and Manchuria are famed in all Asian markets for size, length of hair, and general excellence (see, also, text, page 415).

Photograph courtesy U. S. Department of Agriculture

MUCH MANCHURIAN TOBACCO IS GROWN FROM AMERICAN SEED

Though not exported, Chinese farmers, especially about Antung, grow tobacco for local use. The leaf is very coarse. To improve the crop, the South Manchuria Railway conducts an experimental tobacco farm. It also distributes American yellow tobacco seed to farmers, supervises cultivation, and markets the crop in Mukden. This crop is drying in a field near Harbin.



Photograph by Leonid Dalevitch

A MONGOLIAN INTERPRETER OF HAILAR

To the fairs at Hailar, in northwest Manchuria, come bands of Mongol nomads to trade cattle for cartwheels, leather goods, utensils, and other things the more patient Chinese make. Here, too, as in the bazaars of Baghdad, Bombay, and other oriental markets, trade would be paralyzed but for the nimble-tongued interpreters.

since so few whites can learn that tongue of theirs, once described as "the most imperfect, clumsy, and awkward of all instruments ever devised by man for the communication of thought."

Harbin's trade territory includes more railway mileage than does any other area of China. More than 3,500 miles of track have been laid in Manchuria, and this is being increased at the rate of about 500 miles a year.

Of the present finished lines, more than 2,000 miles belong to the Chinese Eastern System and the Japanese-owned South Manchuria Railway. The remaining mileage, connecting various towns by lines of varying length, belongs to the Chinese, although in most cases Japan advanced the loans and did the construction work. The 392-mile section of the Peking-Mukden line in Manchuria was built with a British loan (see, also, page 385).

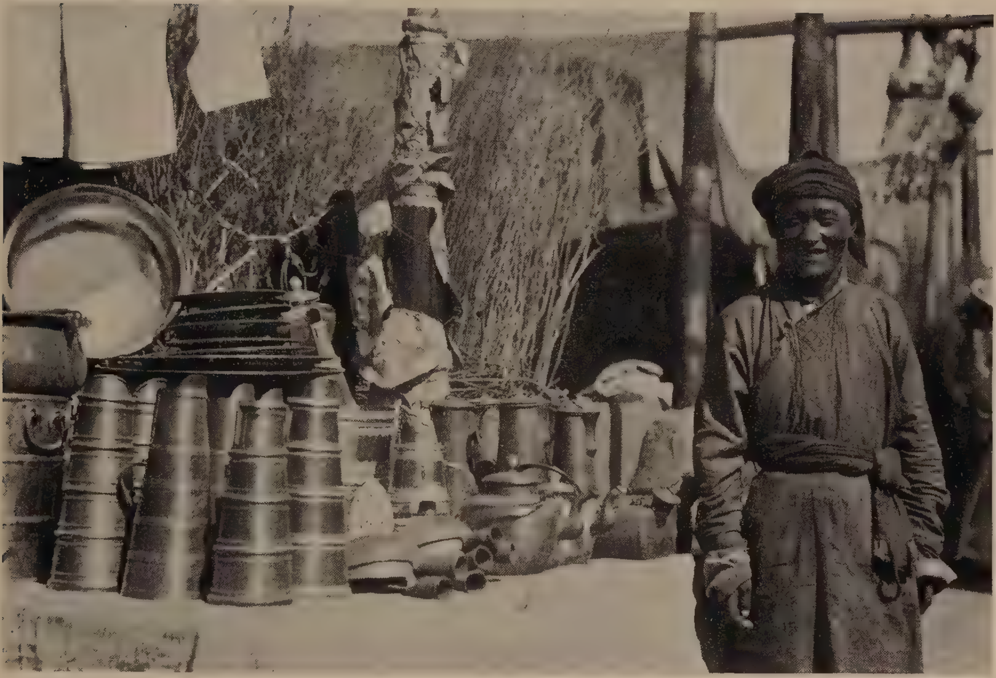
A novel aspect of these Manchurian railways is that, while originally built for military and strategic purposes, unparalleled immigration and farm development now enable them to earn good profits.

HOW THE SOUTH MANCHURIA RAILWAY HELPS SUPPORT JAPAN

The spectacular Flagler railroad over the Florida Keys, the daring push of the long Trans-Siberian line, the war-provoking Berlin-to-Baghdad, the famous Cape-to-Cairo—all these come to mind in the dramatic annals of engineering feats. Theatrical in conception or exploring wild and long-hidden spots on the map, they stir the world's imagination.

Less is heard of the South Manchuria Railway. Yet, in the destiny of the youngest world power, it has become an amazing factor.

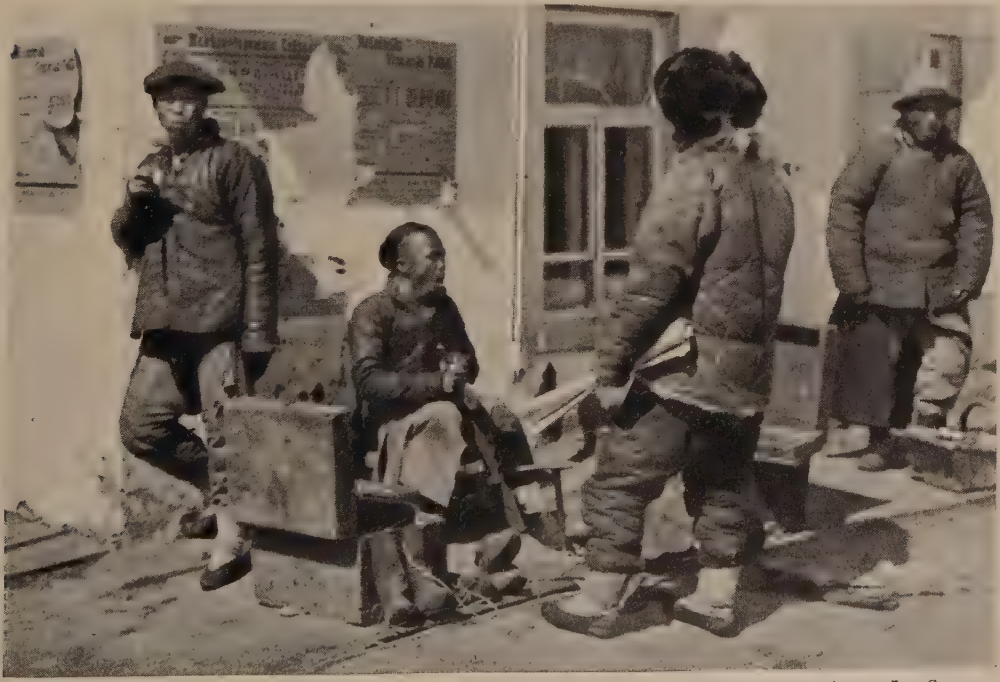
Ride through Japan. Forget the curios, temples, and tea houses, the geishas and frivolous life in the big hotels. Go through the mills or back country, among the hamlets and peasants in the rice fields. See how dense population is; see how even the younger children toil for food;



Photograph by Leonid Dalevitch

"HONEST GOODS AT HONEST PRICES"

Alleges this trader, who has set out his stock of household utensils at a fair in the Barga District of northwestern Manchuria. It is held every autumn and is one of the biggest events in this region for the frontier nomads.



Photograph by Eugene Lee Stewart

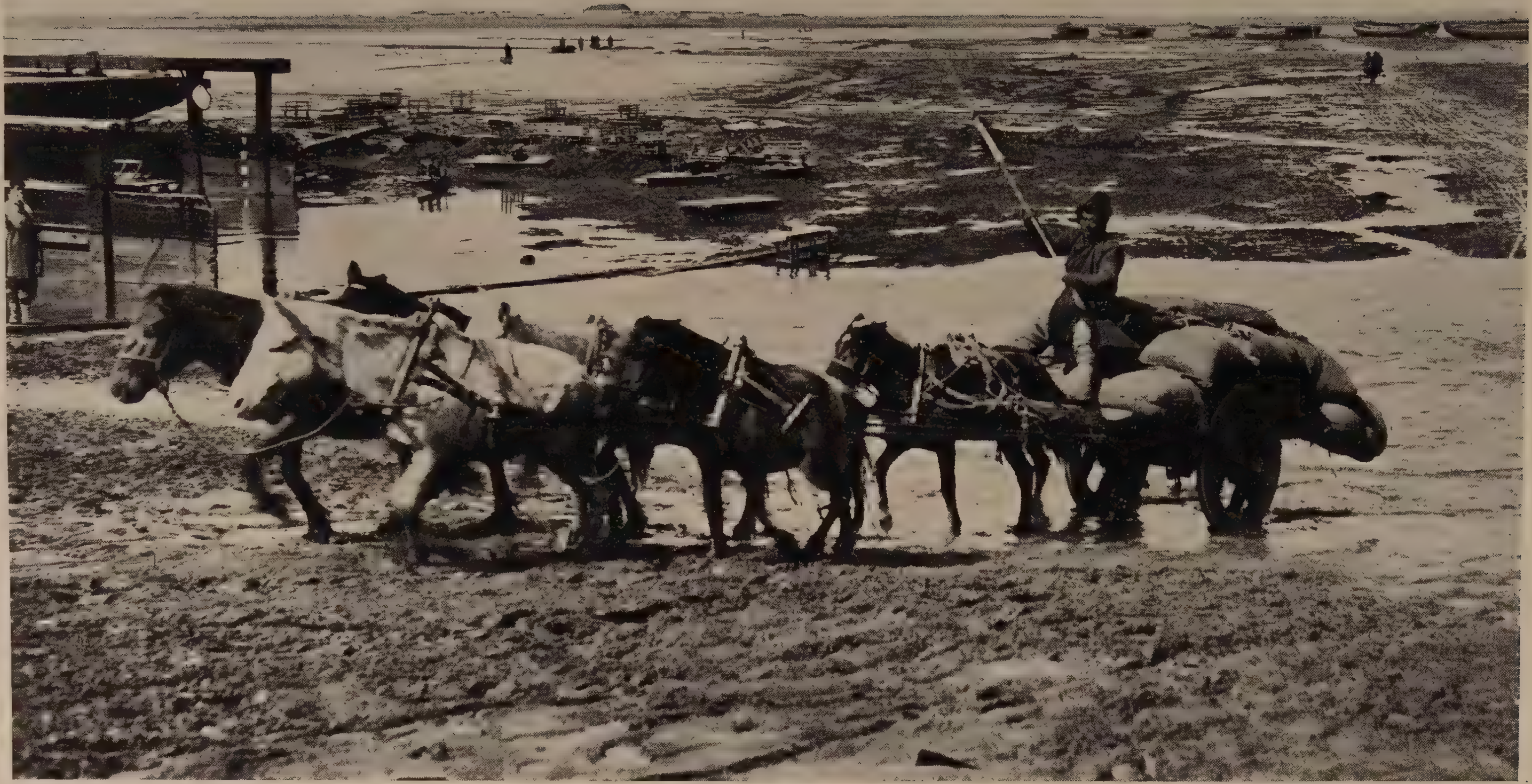
THE SHOEMAKER NEVER LACKS AN AUDIENCE

Chinese of Hailar wear winter clothing heavily padded with cotton. If it gets colder, they will put on another wadded suit. The Russian placards on the Chinese store at the back advertise a Ukrainian entertainment at the local club and theater.

Photograph courtesy U. S. Department of Agriculture

A FLEET OF CHINESE BOATS BRINGING BAGS OF SOY BEANS TO HARBIN

In normal times freight traffic on the Sungari is very heavy. A fleet of steamers is owned and operated by the Chinese Eastern Railway. Native junks and barges also handle quantities of cargo.



Photograph by Alice Schalek

AWAY FROM RAILWAY ZONES AND CITIES, MOST MANCHURIAN ROADS ARE MERE TRACKS ON THE GROUND

Deep, dust-filled trails turn to rivers of mud after a rain, but the clumsy Manchurian carts manage somehow to haul millions of tons of farm products to market. The roads are most passable when frozen hard. Lack of bridges and good roads impedes the import of trucks and automobiles.

Photograph by Eugene Lee Stewart

HAPPY NEW YEAR IN HAILAR ENDS WITH A PARADE

This 10-day event in Chinese life comes later than the Western celebration, and is a mixture of "Fourth of July, Christmas, birthday, and Sunday." Everyone who can buys presents, new clothes, and firecrackers, and all business activity ceases. Prior to the happy day, all accounts are supposed to be settled, lest the debtor lose credit for the next year and have bad luck. All of Hailar's dragon is burned except the head, probably because it costs too much.

and see with what frenzied intensity the island empire becomes industrialized, despite its poverty of raw materials.

Then consider its magnificent South Manchuria Railway, with more than $450,000,000 of assets; study its rôle in the growth and enrichment of this American Middle West of Asia. Then you begin to grasp how, through this busy line and all its kindred works, Japan helps feed herself and find needed raw materials.

To diplomats and military strategists we may leave all debate as to what this line might mean to Japan if menaced by overland enemies from Asia or Europe. Its bread-and-butter aspects alone are fascinating enough.

Running across the front porch of Asia, it is the largest single-unit Japanese enterprise in existence. Including coolie day laborers, at times it has in 1929 more than 100,000 people on its payrolls.

It was Russian-built, as we have seen (see text, page 384), as a steel paw of the Bear, reaching down to the ice-free port of Dairen. Ceded to Japan after the war with Russia, it was changed to standard American gauge and equipped throughout with American engines, cars, and machine shops. Then, reorganized as a stock company, the people of Japan oversubscribed its shares 1,066 times!

Sentiment, patriotism, they inspired the public, of course, for 100,000 sons of Nippon had died beating back the Bear. But, also, the line tapped a vast, virgin granary of Asia, with then unscratched riches in wood, wool, iron, coal, bean cake and oil, furs, meats, fruits—the things Japan hungered for.

FEW JAPANESE MIGRATE TO MANCHURIA

Here was space, too, said a watching world, after Japan leased Liaotung (see text, page 386), where her surplus people could find homes. *But they have not.*

Photograph courtesy U. S. Department of Commerce

CHINESE IMMIGRANTS FLOCKING INTO MANCHURIA

With bundles, pots and pans, and often carrying aged parents on their backs, millions of Chinese are migrating to virgin farmlands in this fertile corner of northeast Asia. Riding flat cars, this motley group is entering the Promised Land over the Peking-Mukden Railway, which runs through a gap in the Great Wall near Shanhaikwan.

Photograph courtesy South Manchuria Railway

CHINESE LUMBERJACKS BRING THEIR RAFT TO THE YALU'S BANKS AT ANTUNG

For their use on the long voyage, lumbermen often pile dirt on the raft and grow a small vegetable garden en route. This lumber trade is diminishing as forests are cut off.

COOLIES WALKING ASHORE TO THE PROMISED LAND

At points in Manchuria where large companies of Chinese immigrants arrive, "same village" committees meet them, so that old village neighbors may be settled near each other in the new country.

In all Manchuria to-day there are less than 200,000 Japanese, and nearly all of them live in the Kwantung Leased Territory and the Railway Zone.

In other words, only a few thousand Japanese have settled in Manchuria proper, since the great migration, compared with millions of Chinese. But since Japan annexed Korea, in 1910, a Korean migration estimated at anywhere from 900,000 to 1,000,000 has crossed the Yalu, to grow rice and other farm crops in Manchuria. And very few of these Korean colonists have settled in the Japanese-controlled areas. Many have become citizens of China.

Could the Japanese farmer have competed with the Chinese, whose standards of living are lower; or could he have found happiness on the great plains, so different from his own hilly homeland of temples, brooks, and cherished institutions, Manchuria might have helped solve the island kingdom's problem of surplus people.

When it became plain, however, that Japanese would not colonize here any more readily than they have done in Taiwan (Formosa), Japan boldly took a new course. With characteristic energy and thrift, with capital and technical skill, she set about to further the farm and commercial development of Manchuria. Her interests there to-day are strategic and economic, and their development is a pivotal point in her foreign policy. She has steadily built up an organization of various units, all smoothly coördinated. These comprise the Kwantung Government, with its military and consular forces; the Government-controlled South Manchuria Railway and its many ramifications; various semi-official banks, produce exchanges, and many privately owned trade and industrial enterprises. Through these broad, far-reaching activities she not only draws an ever-increasing stream of needed raw material, but she also builds up a growing market for her own manufactured goods. And, at the same time, she sees developing, within easy reach, a source of food supply of tremendous potentialities. So far, however, her chief food imports from Man-

Photograph by Underwood & Underwood

MIGRATING CHINESE, PACKED LIKE CATTLE IN A CAR

War and famine, sweeping through densely peopled Shantung Province, impel hordes of peasants to join the great migration to Manchuria. A coolie ship arrives at Dairen.

churia consist of beans or bean oil, largely used as a sauce in cooking, and salt. From British India, French Indo-China, Australia, Canada, and the United States she buys her other chief imported foodstuffs, such as rice, wheat, beef, and fresh eggs.

To develop Manchuria as a further source of food supply, the Japanese are experimenting actively with various farm and live-stock enterprises, and such kindred trades as wool and hides. And, along their Railway Zone, as in the Leased Territory, they are busy in mines, mills, and factories as directors, minor officials, technicians, and skilled artisans. To a large extent, they have coöperated with the Chinese in railway construction, lending money and trained men for this work. But, since the country is so preëminently a farming land, it is the millions of Chinese settlers who really do the work of Manchuria.

Retail trade, also, is almost all in Chinese hands. Following the migrating peasants, many Chinese merchants have come into the country. Often the immigrant farmer, grown rich enough, has turned merchant or banker.

CHINESE ARE THE WORLD'S CANNIEST STOREKEEPERS

In cities like Harbin and Mukden the Chinese merchant has active competition, of course. Here Russians, Japanese, Americans, and other foreigners battle as jobbers and importers, and even foreign-owned department stores flourish, specializing in imported clothing, drugs, toilet articles, hardware, sporting goods, preserved foods, and novelties. But in provincial towns and villages the Chinese-owned store has a monopoly. It supplies not only the more simple wants of poor peasant and prosperous farmer, but also carries patent medicines, alarm clocks, music boxes, bicycles, perfumes, soaps, cheap jewelry and watches, and all the trash dear to the heart of middle-class Chinese and middle-class people everywhere.

But the Manchuria Railway, most monumental of all Japanese enterprises, is not remarkable as a railway alone. In fact, its many associated activities and

Photograph by C. Walter Young

MILLIONS OF MANCHURIAN CHINESE LIVE BY GROWING SOY BEANS

A visitor arriving at any Manchurian seaport or busy railroad station after harvest time is utterly bewildered at the almost incalculable piles of beans heaped high on every side. Cleaning beans at a freight yard.

economic ramifications have caused it to be sometimes styled the "East India Company of Manchuria."

That narrow 686-mile strip of Japanese leased right of way through which the line runs has been compared to the American-owned Panama Canal Zone for neatness and efficiency of administration. With its chain of tourist hotels, its model schools, kindergartens, hospitals, laboratories, and farm experimental stations, all set up and operated for the development of Manchuria, it is indeed a singular force for Western civilization in Asia. Through its agency Japan applies locally what she has learned from America and Europe.

ONE OF THE WORLD'S RICHEST COAL FIELDS

Long ago wandering Koreans, venturing into South Manchuria, stumbled over black rocks sticking out of the earth—"rocks that would burn." This may have been among man's first uses of coal. But, later, mining was forbidden by Manchu princes, lest it disturb the rest of ancestors buried about Mukden.

In time, of course, the Chinese, and then the Russians, came to work these coal deposits; but large-scale production came only when the Japanese acquired the railway. With American aid and advice, they put in modern machines and methods and opened up one of the thickest coal seams ever found anywhere. In places, the vein measures 420 feet. This famous Fushun field lies to the east of Mukden, and its output has reached 7,000,000 tons in a single year (see page 424).

As Mexico buys three-fourths of her imports from the United States, so, lying so near by, Manchuria buys heavily from the Japanese.

You can grasp quickly the astonishing extent to which Japan is working for herself, yet building up economic Manchuria, when you look at the tip of Liaotung Peninsula. Crowded into that Leased Territory are probably 300 or more manufacturing plants and industries, employing more than 800,000 people, mostly Chinese. The wide scope of progress is revealed here in many iron works, chemical and

BRANCH BANKS ABROAD ARE OUTPOSTS OF AMERICAN TRADE

Lately erected at Mukden, flying the flag, and flanked by American-made motor cars, this branch of a great New York banking house reflects the 20th-century tendency of American commerce to attain and hold a permanent position abroad.

soap factories, brickyards, bean-oil mills, car and wagon shops, lumber yards, shipbuilding, printing, cement, and other plants.

SCIENCE NURSES NEW INDUSTRIES

Outside the area leased by Japan, important industries also thrive. The "big three" are bean-oil mills, flour mills, and distilleries that make a drink from kaoliang, a sorghum plant.

In the great soy-bean industry one sees again the pioneering work of Japanese. Up to 1910 this bean was not active in world trade. Since then, aided by experiments in the chemical laboratory of the South Manchuria Railway at Dairen, many uses for it have been found. It has made its way into soup, soap, cheese, salad material, explosives, enamels, varnishes, linoleum, water-proofing, paints, printing inks, lubricating oils, flour, macaroni, and crackers. Bean cake solved the fertilizer problem of Japan, whose increasing millions must plant in rice every possible foot of their old, worn fields.

The value of Manchuria's annual farm yield is reckoned at about $500,000,000, of which the soy bean is the leading item. To aid Chinese farmers, the Japanese carry on research work at Kungchuling and other experimental farm stations. This has increased production per acre and improved the oil content of the beans.

In America we see science seeking new materials and finding new uses for old ones. It is so in Manchuria, too. In this work the Japanese, to whom a prosperous Manchuria means so much, are leaders. Active far beyond its function as a carrier, we find the railway engaged in wide research work at its laboratories, in quest of new materials and methods which may lead to sound commercial enterprise. In its experiments with pottery, the wild-silk industry, textiles, oil distillation from shale, firebrick and glass, as well as its development of iron and coal deposits, it has aided tremendously in the growth of local industries.

Such facts are not mere guidebook dry bones or dreary dust from consuls' files.

Photograph by Leonid Dalevitch

TOO MANY IDLE LAMA PRIESTS MAKE A SERIOUS SOCIAL PROBLEM FOR MONGOLIA

Every family dedicates one or more sons to the priesthood. They become an ignorant, idle body of men, parasitic upon the lay population, which must constantly struggle to support them. They rule their superstitious, easily frightened flock by a religion of terror, for Lamaism, a corrupt offshoot of Buddhism, has demons and other evil spirits who must be placated.

Set in sequence, they form the fascinating plot of that drama which is changing this long-empty Asian area into new homes for migrating millions.

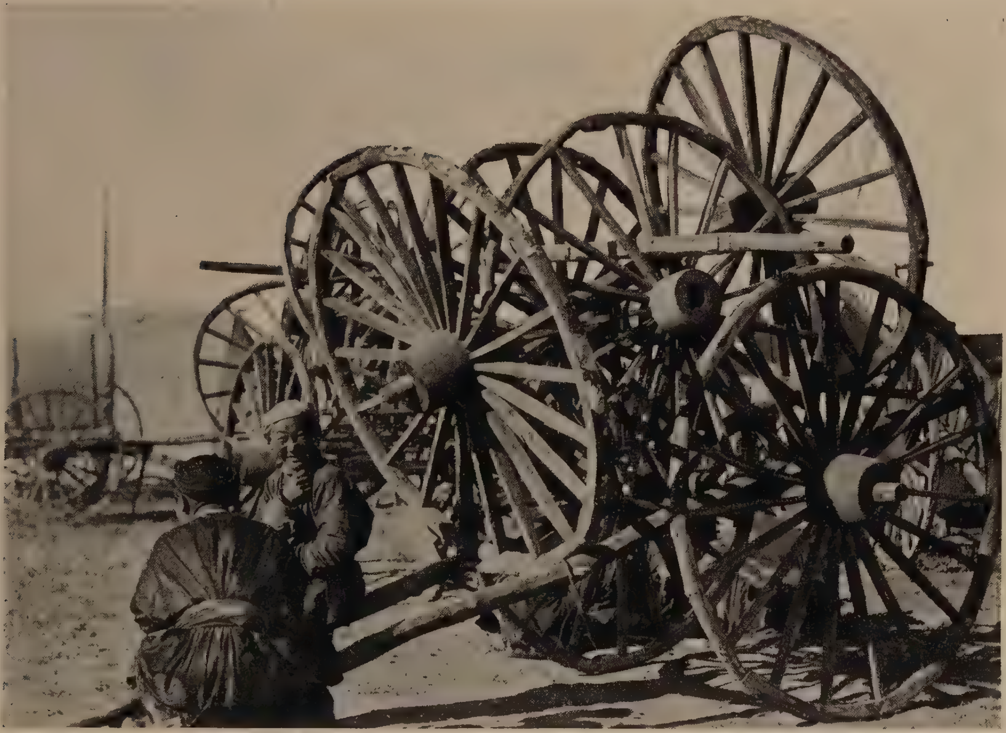
MUKDEN, THE CAPITAL, A CITY IN TRANSITION

Mukden's sharp contrasts are symbols of New Manchuria. Radio words and music echo now against moss-grown tombs, lama towers and pagodas, already old and cracking when all that man knew of electricity was that amber, if rubbed, drew bits of straw to it. Now across old Mukden's public execution ground, where crowds once flocked to see clever swordsmen sever heads at one stroke, there glides the shadow of passing aircraft; and hard by is a new experimental farm station, where the hoe is above the sword. Oil, flour, and woolen mills and a great arsenal hum and rumble where imperial bowmen used to shoot practice arrows at the sky.

There is still old walled Mukden, with its yamens and palaces of Manchu days; but west of it an International Settlement, with foreign consulates; then New Town, or the Japanese railway quarter, with bright lights, motorcycles, and Berlin-like architecture. Only yesterday, it seems, Togo and Kuropatkin were on the front pages of the world's papers, and Manchuria was wild, empty, and far away. In what a short time the power of railroads and colonists have literally pulled the country forward by ten centuries!

AMERICAN INTERESTS IN MANCHURIA

One of my vivid mental pictures of the East is a morning visit to a Chinese Christian mission. The white missionary had let his hair grow to a pigtail and wore Chinese clothes. Standing on a rostrum, he played the air of a familiar hymn on a horn, and the Chinese sang. They sang to our old revival tune, but the words were Chinese!



Photograph by Leonid Dalevitch

"WHEELS WITHIN WHEELS" AT A MANCHURIAN FAIR

Next to cattle-raising, the Mongol's chief business is the transport of goods. For this he uses not only camels, but 300,000 or more two-wheeled carts. But he is no wheelwright; he must buy from Chinese workmen. These rude wheels have no iron tires, but merely flat pieces of metal spiked on where rim pieces join.

Manchuria, like the rest of China, has long come within the scope of America's missionary and educational work and her traditional Open Door Policy.

But as a mere buyer of American goods she ranks low. Canada, our best customer, takes our wares each year at the rate of about $90 worth for every person in that Dominion. To the Manchurian, in comparison, we sell 35 or 40 cents' worth. Most of this is in the form of steel rails, railroad engines and cars, electrical goods, farm implements, motor vehicles, tobacco, and kerosene.

To a singular degree Chinese learn from missionaries the use of bicycles, phonographs, clocks, plows, sewing machines, and many other objects of American manufacture, which some buy by mail, through the aid of the missions.

In value we buy about as much from Manchuria as we sell her; but it is astonishing to learn that chief among our imports from there are dogskins and pig bristles. Other furs, horse tails, soy-bean cake and oil, and wool also are sent us. In China one sometimes sees thousands of horse tails hanging like grapevines on a trellis to air and be sorted.

The black or yellow mongrel dog, or *wonk,* is a well-known character in all North China. Any American who has tried to approach a Chinese farmhouse or walk through a village knows this dog. Some farmers keep from 20 to 30, and even more, of these surly beasts. If you are on a horse, they ignore you; but they are trained to attack immediately any man on foot or any prowler lurking near their master's house. To avoid being bitten, we once had to kill a village wonk. In a jiffy, it seemed, the whole village was after us, with rakes, hoes, and old guns—too old for accuracy, so they missed us!

Thousands of these mongrels are raised in Manchuria for their skins. In parts of Manchuria and Mongolia where the dog-fur business is brisk, when a girl marries she is given a few dogs as a dowry.

These dogs mature in six to eight months.

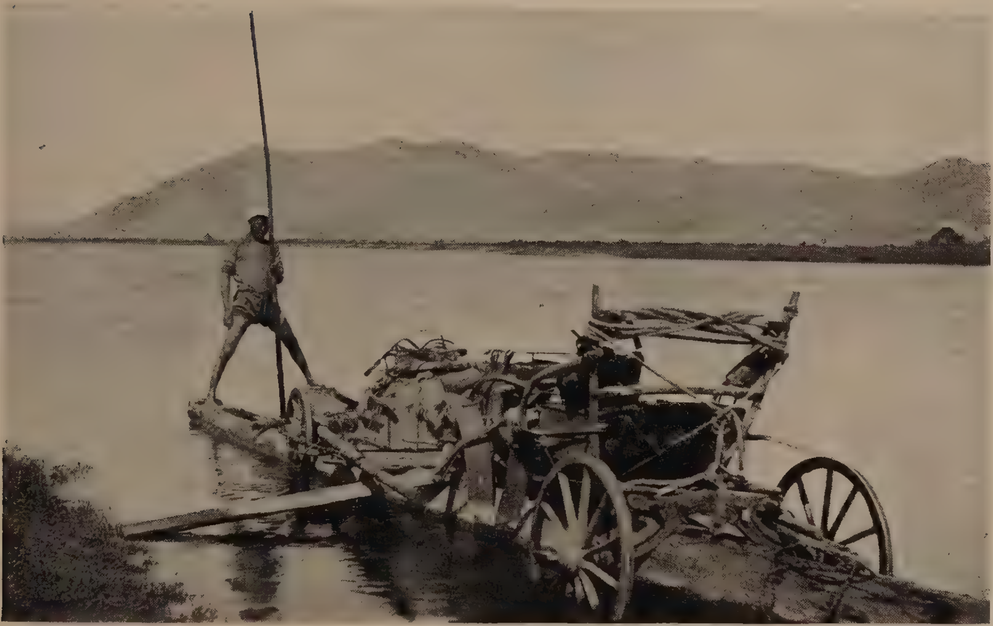
Photograph by Knud Sorensen

THE MYSTERIOUS GYPSIES, WHOSE ORIGIN IS LOST IN ANTIQUITY, HAVE PENETRATED EVEN INTO MONGOLIA

Dressed like Russian peasants, they speak here their own ancient language, a primitive Indo-European tongue, preserved in no manuscript or book and used only by gypsies. Their only contribution to modern civilization has been their gay, passionate music. Liszt ascribes to them the "origin of Hungarian national music." Of wiry figure, with black, silky hair and bright eyes, they first appeared in the Greek islands during the 14th century.

In winter, when their fur is thickest, they are strangled and skinned. Dried and frozen, the skins come in bales to markets like Mukden. Here, before the spring thaw affects them, they are cured, sorted, and made into the "mats" and "robes" of commerce. Of course, dog fur is not sold, when made up by furriers, as "just dog." It often masquerades under the high-sounding names of more fashionable fur-bearing animals; so that milady, marching happily down Fifth Avenue or strolling with the Easter crowd on Atlantic City's Boardwalk, never dreams that somewhere in Manchuria it was poor Fido, and not a skunk, fox, or kolinsky, who died to make her coat or "choker." Kolinsky, kin to weasels, is also known as red sable, Tatar sable, and Siberian mink.

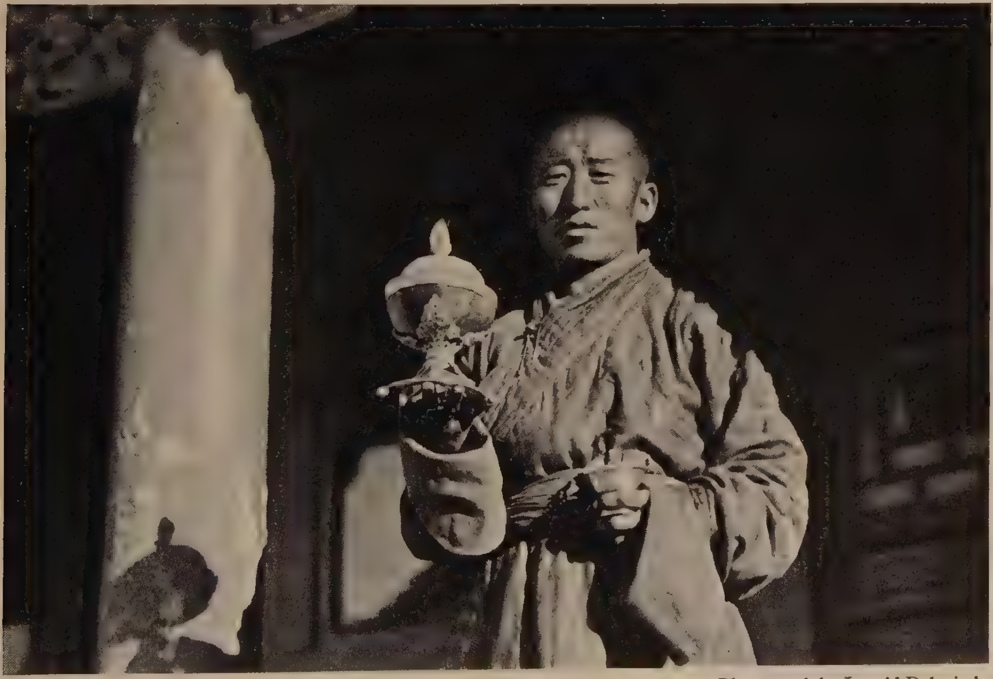
Fox, sable, ermine, squirrel, dog, and



Photograph by R. Harboe

HOLLOW TREE TRUNKS LASHED TOGETHER MAKE THIS FERRY

The front wheels and part of the carriage have been detached and placed well away from the rest to insure better balance. The Mongol uses his long pole until he cannot reach the bottom any longer with it, then drifts with the current until he gets near enough to the opposite bank to use his pole again. These primitive types of ferry are common in northern Mongolia.



Photograph by Leonid Dalevitch

EVERY THIRD MAN IN MONGOLIA IS A LAMA

The priests who live in family yurts, as permanent guests of relatives, are of a better class than the monastery priests and are much respected everywhere. This Barga lama holds a holy cup made of a girl's skull and adorned with gold and silver (see, also, page 414).

Photograph by Leonid Dalevitch

MONGOL AND NORTH CHINA PONIES ARE POPULAR ON THE RACE TRACKS OF THE FAR EAST

Mounted on these sturdy, shaggy-haired horses, Mongol hordes roamed from Asia to eastern Europe long ago, conquering as they went. This short-legged beast is famous for its endurance and often for its bad temper. Among Mongols, both men and women are at home in the saddle. A Mongol prince and his mount at a Manchurian fair in the Barga District.

goatskins, horsehides, with now and then a tiger or leopard skin—all these we get from Manchuria. From China, in fact, we import more furs than from any other country; but right here in the United States, though few Americans know it, more fur-bearing animals are caught than anywhere else in the world. While fur is sixth in value among all our imports, we ourselves trap up to $70,000,000 worth a year, mostly in the Mississippi basin. St. Louis, Missouri, is one of the greatest raw-fur collecting centers in the world.

Americans, trying to sell goods in Manchuria, turn up strange facts about the country. Last year Oregon pine easily undersold native lumber along the lower Yalu. This, says an official report, was because of unusual activities of a bandit group known as the "Big Swords." In 1928 only about 2,400 rafts of logs came down the Yalu, instead of the usual 3,000 to 7,000, because of bandit raids. For the same reason only half the bean crop in the bandit region was harvested.

Such bandit organizations, known as Hunghutze, have plagued the land for generations.

Long ago the Manchu régime at Peking used to deport Chinese criminals to Manchuria, and these were probably the ancestors of many modern bands of thieves. Cases are on record of as many as a thousand robbers working in one regiment. Being caught and held for ransom by Hunghutze, or "shaken down" for cash payments by other kinds of bandits, is a common experience of rich Chinese. The rich expect such treatment every now and then; it is a sort of tribute or confirmation of their standing in the community.

In the nineties, when Japan invaded Manchuria in her war with China, a pro-

Photograph by Knud Sorensen

POTLUCK À LA MONGOL

A friend has just ridden up on his white horse to join the *al fresco* meal of this Mongolian family on the move. Like some tribes of American Indians, whom they resemble, the Mongols cannot endure a settled life. All their belongings pack easily on the back of a camel; the few calfskin bags with provisions, the tent, the cooking pots, the grate, two water buckets, and a few odd pieces of felt are all that they enjoy—these and space to journey through.

Photograph by Leonid Dalevitch

THE CAMEL MAY BE USEFUL, BUT THE MONGOL PREFERS THE PONY

The native breed is seldom more than 13 hands high, but for endurance and cleverness the Mongol pony has few rivals. In the depth of winter his owner neither feeds him nor provides him with shelter. For food the pony scrapes away the snow to find the remains of the summer grass underneath, and for protection against the bitter cold he grows an extra suit of hair.

Photograph by Knud Sorensen

ONCE IRKUTSK TRADED HEAVILY WITH MANCHURIA

Leading, as it does, from Russia across Siberia and over Manchuria, the long Europe-to-Asia railway system in normal times would transport enormous through freights; but since the U. S. S. R. placed all export trade under official control, such traffic has dwindled. Many furs are smuggled from Siberia into Manchuria, but eastbound through cargo on the railway is very light. An ever-increasing volume of goods, however, imported via Vladivostok, reaches Manchuria over the east end of the line. A market stall in Irkutsk.

vincial governor offered a bonus to certain robber bands, it is told, if they would take the field and turn back the armies of Nippon! The bandits, probably mindful of the good will and cumulative experience at stake in their own business, declined to become mercenaries!

Swift as the wave of modernism is, one sees it most, of course, in cities. At Mukden, for example, is a new American bank building typical of Yankee bank architecture. More than 7,800 new buildings were erected last year, using much American hardware and plumbing and including a dozen or more large structures of steel and concrete (see pages 396, 413).

As the American bookkeeper has his calculating machines, so the Chinese clerk employs his abacus. One hears the click-click of its little round wood balls in every bank and in the back of every big store. Russians use it, too; and often an American or British accountant, caught away from his adding machine, calls in a native with his "pagan" counting apparatus to verify a sum.

Through Vladivostok and up to the Chinese Eastern comes an ever-growing stream of imports, with American footwear, haberdashery, cotton goods, fancy belts, wrist watches, and fountain pens; and in Harbin, too, every aspect of modern life, from radio to Russian grand opera, but always the contrasts! A consular report solemnly says: "Recent construction work sees the completion of a broadcasting station and the beginning of a temple to Confucius"!

Farm tractors are popular, especially in regions where horseflies are bad. But they are still very rare. It is the millions of shaggy ponies and the ubiquitous mules which do the work.

Of all familiar farm scenes in Manchuria, the shoeing of the family mule

Photograph by International

THE MUSICIANS PAUSE FOR BREATH

These Mongolian lamas in grotesque headgear are playing at a Buddhist celebration. Most of the festival is devoted to the Dance of the Gods, which takes place in front of the temple and ends with the famous Tibetan devil god dance (see, also, "Life Among the Lamas of Choni," by Joseph F. Rock, in the NATIONAL GEOGRAPHIC MAGAZINE for November, 1928).

is the most ludicrous. A kind of gallows is rigged and the mule trussed up to prevent kicking. Even in that apparently helpless fix I have seen them reach around and sink their teeth into a jabbering native's padded clothing.

Through mud, dust, and heat, or over the hard frozen ground of winter, these mules drag the heavy carts and often stand out all night in a temperature far below zero. Usually, the Chinese takes fairly good care of his mule. But even when cudgeled the mule seems not to mind it. He will nose about for stray bits of grass even while getting roughly beaten and soundly abused in choice Chinese vituperation.

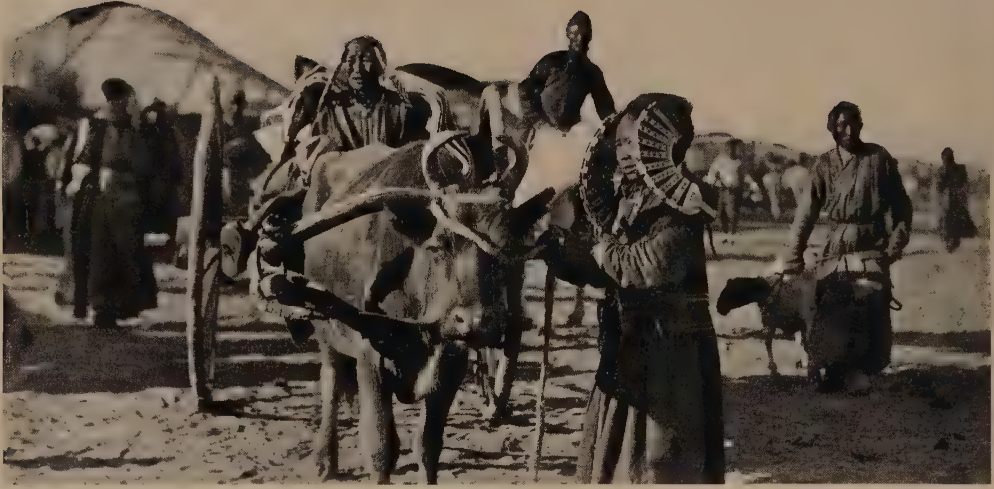
In and around Harbin more than 1,000 motor busses are seen; a few Manchurian hotels advertise roof gardens and grills. Motion pictures are shown, with a Russian and Chinese translation of titles on a small side screen. Yet, away from foreignized life in railway zones and cities, Chinese farmers still use only the implements of their ancestors. A stone "stove," fired from outside the house, heats it by day and serves as a bed by night. Covered only with sheepskins, it is hard but warm. I know. I spent nights on one when the temperature was 40 below and the Liao was frozen over. I didn't sleep much—for reasons any imaginative entomologist will understand.

NOT ALL OF MANCHURIA IS MODERNIZED

Settling hundreds of thousands of poor immigrants on raw lands, where they usually start life with not even work animals, seed, or implements, is the grave responsibility that Manchurian authorities must face.

On paper, this unparalleled migration that is rapidly making Manchuria such a busy place affords romantic and popular reading in this age of industrial miracles. But the picture does not show the whole stage nor all the actors on it.

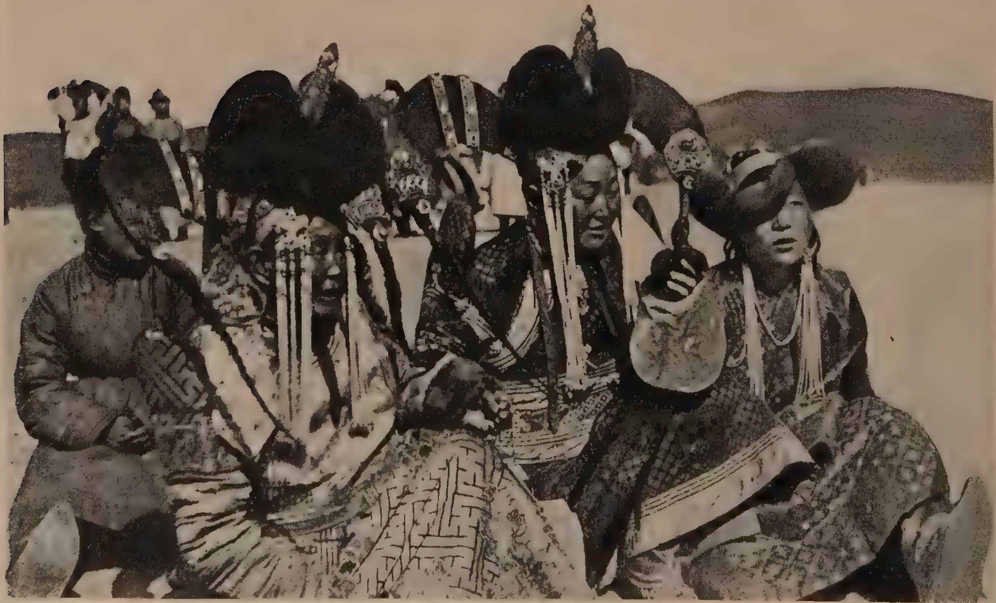
Outside the railway zones and away from cities, roads are still mere tracks on



Photograph by Leonid Dalevitch

MONGOL WOMEN COME TO HUNT BARGAINS AT A MANCHURIAN FAIR

Their overelaborate, clumsy headdress seems oddly out of place for women who must live in primitive yurts and ride in crude oxcarts; but the feminine quest for adornment seems universal. At this nomad-Chinese fair in the Barga border region as many as 10,000 tents are often set up.



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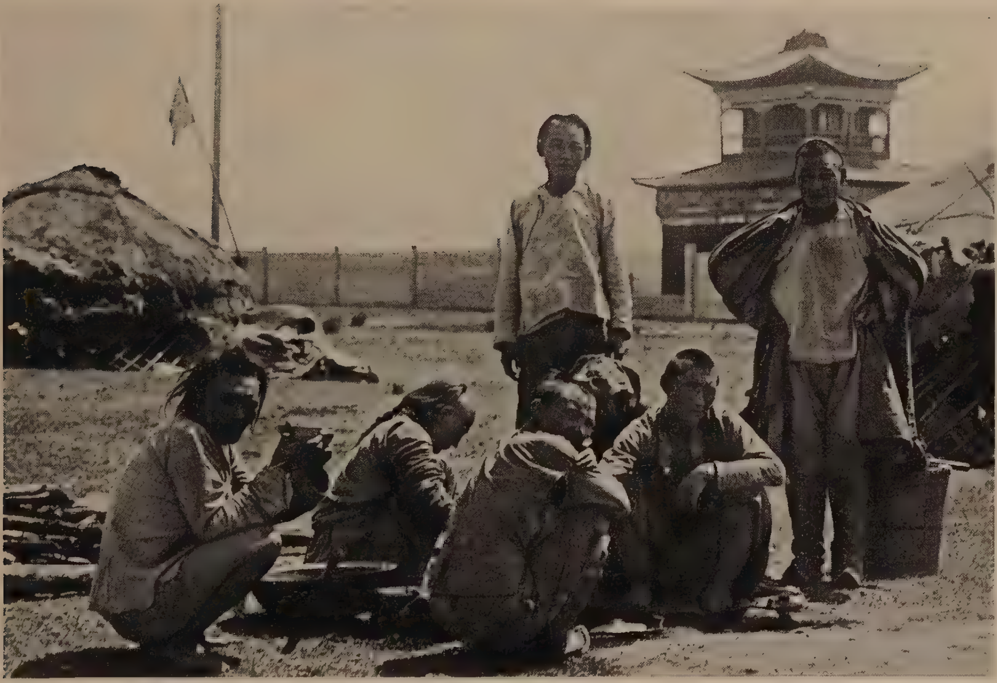
BELLES OF THE STEPPES

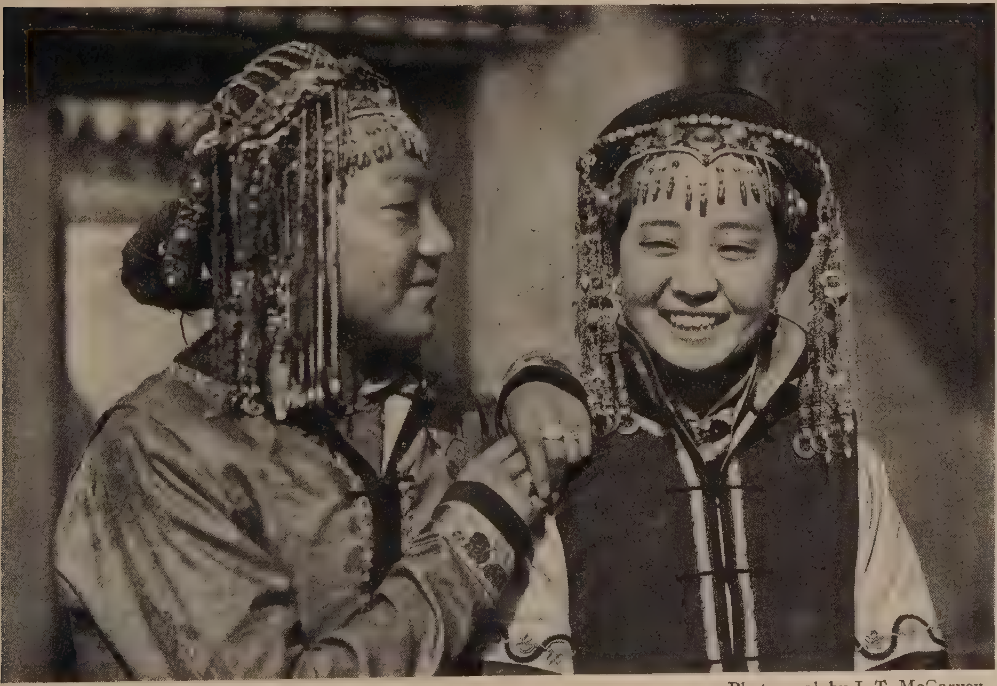
Their hair is arranged in great crescents and adorned with silver pins, buckles, rings, coins, and curtains of red coral, turquoise, and pearl. Plain workaday clothes have been discarded for gowns of expensive silks.



Photograph by Knud Sorensen

MESS CALL ON THE STEPPES OF THE MONGOLIA-MANCHURIA BORDER

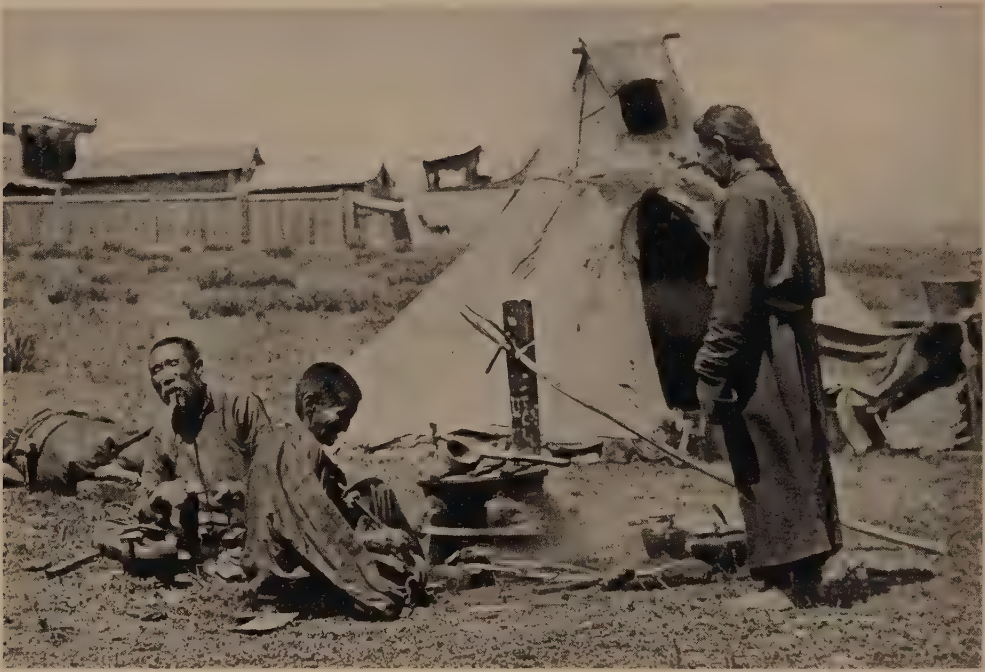
Mutton boiled with a kind of millet, washed down with quantities of tea or milk, is the favorite dish of these Mongolian soldiers. To the left and right are two yurts (felt tents) and in the background is a temple.



Photograph by J. T. McGarvey

MONGOLIAN WOMEN WEAR THEIR WEALTH ON THEIR HAIR

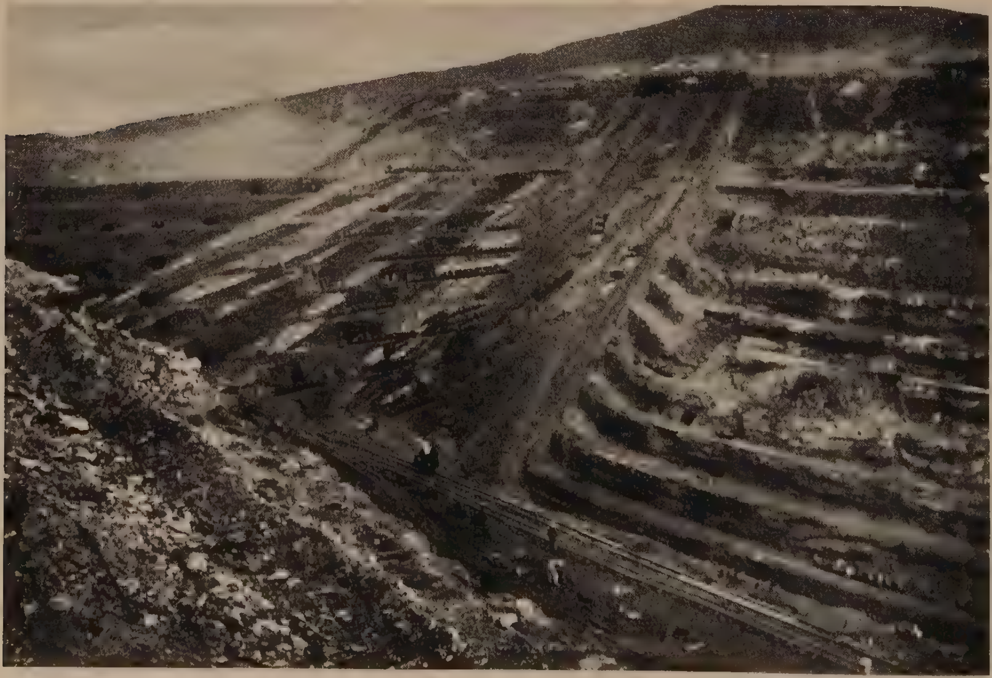
The precise nature and shape of the adornment varies with the tribes, but even a poor girl, once she marries, somehow manages to obtain a profusion of silver ornaments to wear on her head.



Photograph from Horace Brodzky

THESE BURIATS MIX BUSINESS WITH PLEASURE AT URGA

They are just in from Peiping (Peking) with their camels and merchandise, and have pitched their tent at Mai-Mai-Chen, the Chinese business quarter of Urga, the Mongolian capital. Practically all of Mongolia is commercially tributary to this city.



Photograph by C. Walter Young

FUSHUN OPEN-PIT MINES SUGGEST THE BROWN COAL FIELDS OF NORTH GERMANY

The coal vein in this Manchurian field reaches the amazing thickness of from 80 to 420 feet. Though long known to exist, development on a modern scale began only within recent years. Now Manchuria's economic position is greatly strengthened by this vast coal supply (page 412).

Photograph by Eugene Lee Stewart

AN OVERLAND LIMITED OF THE DESERT

Loaded with blankets, clothing, tobacco, and other commodities, a Russian caravan is leaving Hailar, a horse and cattle center in northwestern Manchuria, for its long trip across the Mongolian border to Urga, a distance of almost 600 miles as the crow flies.

the ground. Except when frozen over, they are impassable for motor vehicles. So the squeaking, clumsy cart and myriad small sailboats on the streams still move most goods and people. Among many peasant farmers a vague, superstitious fear lurks that it is some unseen force of evil that propels the horseless plow, and they will not even approach it. This same fear, in the early days of railroad-building, led North China fanatics to attack a construction train, dig a hole beside the track, dump the engine into it, and thus bury alive the hissing fire monster!

At present less than half of the arable land of Manchuria is plowed. Economists estimate that it may some day support a population of 100,000,000. Besides the vast extent still available to new settlers, wide areas are forested hills and wild, rough regions, where only hunters, loggers, and robbers venture.

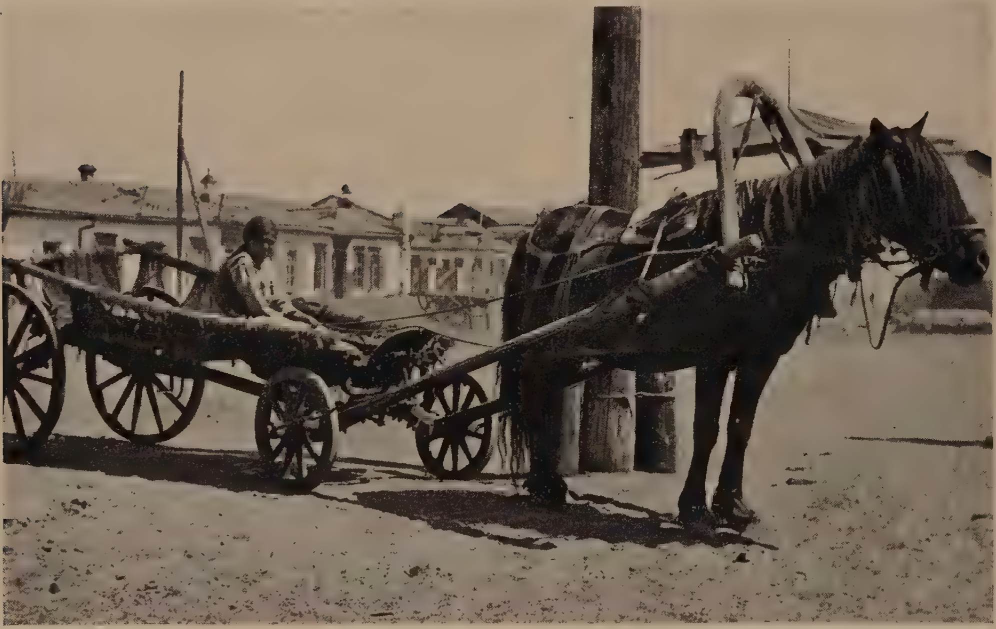
All Manchuria was primarily a forest-meadow country. Once the big woods stretched over valley and mountain, as in Alaska and British Columbia. Trees covered the Yalu Valley almost to its mouth; they grew over much of the Ussuri Valley, over the Sungari basin, along the Amur, and of course they shaded the slopes of the two Khingan Mountain ranges. But many forests have been wiped out by settlers and lumbermen.

Mukden Province is almost all under cultivation, but wooded areas still abound in Kirin and Heilungkiang provinces.

WILD LIFE ABOUNDS IN MANCHURIA

With its trees, meadows, and streams, its fur-bearing animals and climate, Manchuria is much like that part of Siberia which is cut off from China by the howling wastes of Gobi and Mongolia.

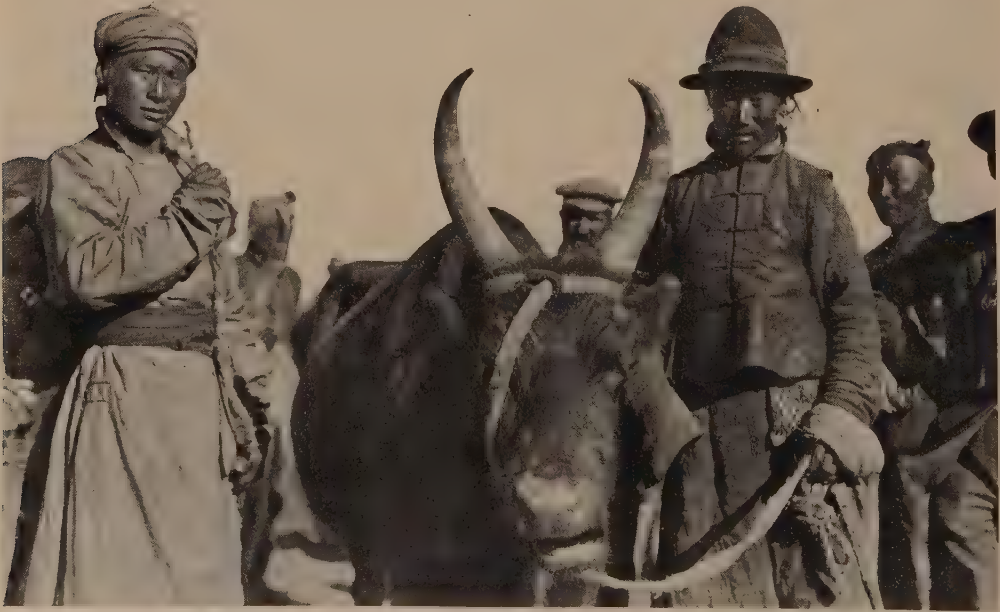
Its wild animals are linked to those of China by a mingling of species; but many are similar to those of east Siberia and, through them, akin to the fauna of northwest America. Some naturalists believe that camels went from America to Asia by the old land bridge that crossed what is now Bering Sea, and that certain bears came to America from Europe by that path. That the North American Indians, originating in or about the Mongol coun-



Photograph by Eugene Lee Stewart

A DAUGHTER OF THE BORDER

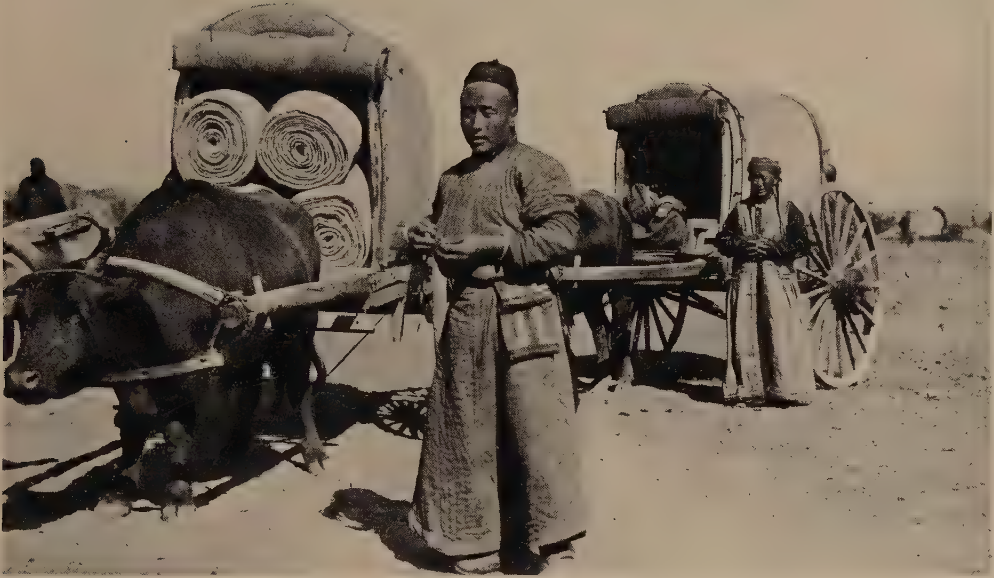
This Russian girl, who drives a peasant wagon, lives in Hailar, near where the boundaries of Siberia, Mongolia, and Manchuria meet (see map, page 384).



Photograph by Leonid Dalevitch

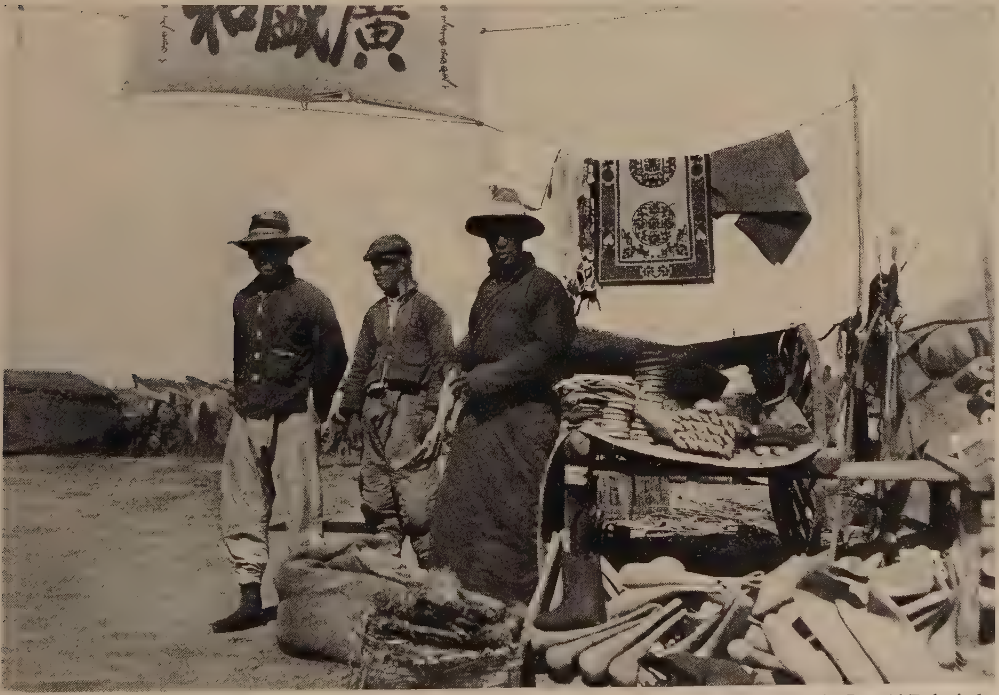
THE PASTORAL AGE LINGERS ON THE MANCHURIA-MONGOLIA BORDER

To many nomads, milk is the chief reason for raising cattle; beef is regarded as a by-product. But oxen draw the lumbering carts and furnish Russia, China, and other countries with meat and hides. In summer the owners pasture the animals near water; in winter they seek places on which the snow lies fairly thin, so that the cattle can get at the grass underneath.



OFF WITH A LOAD OF THE EVER-USEFUL FELT

Some of this heavy material, which he bought at the Barga District fair, will be used as a covering for the nomad yurt and cart, and some as rugs.



Photographs by Leonid Dalevitch

PIONEERING CHINESE TRADERS TRAFFIC WITH THE BORDER MONGOLS

A Chinese has opened up his trading tent at the Barga fair with a stock of goods, ranging from rugs to felt boots, to catch the nomad eye. Though the Mongol likes the cheap goods of the Chinese traders, he fears their countrymen as colonizers and notes with alarm how tilled fields are already encroaching on the steppe, which till now has been his undisputed domain.

tries, came to our shores by this same route is, of course, a familiar theory.

Of all Manchurian animals the great woolly tiger is king. One sees his skin now and then, brought frozen to Mukden and Newchwang. His coat commands a high price, and skins measuring 12 feet and even more in length have been marketed. But it is not his skin alone which has led to his becoming almost extinct, except in the remote forest areas of the Khingans, and other mountains, and the thinly settled areas along the Amur and Ussuri. Chinese believe the bones, heart, and blood of the tiger have medicinal properties of great power. Cure-alls brewed from his kneecaps and claws fetch a high price.

Up to a few years ago, these giant tigers were plentiful in Manchurian forests. When the western part of the Chinese Eastern Railway was being built, so many workmen were killed by them that it is recorded a regiment of Cossacks was employed as guards. The animal was even known to enter the huts of Chinese and Russian settlers and carry off the inmates.

Besides its tens of thousands of domestic dogs, Manchuria also knows a wild dog, or *tsai-kou* (wolf dog), as the natives call it. It hunts in packs, killing deer and wild pigs. Though Chinese hunters welcome no encounter with a hungry pack when the ground is covered with snow, they often slay these animals and probably many of their skins find their way to American markets.

North of Shanhaikwan we hunted bustards, and along the Liao, when flood water lay on the fields, we saw wildfowl in countless thousands. They swarmed till the sky was fairly blackened, as now and then we see migrating blackbirds moving cross Middle Western fields in great dark rising and falling waves.

Where settlers have colonized thickest, as in Mukden Province, the once numerous pheasants and partridges are much diminished, although the export of game birds still goes on. In one winter, from Changchun 800,000 pheasants were shipped, and I once saw them selling in the native markets for the equivalent of five cents each.

Yet slowly, inevitably, wild life yields; farmers oust the hunter and trapper.

Earlier dwellers play no part in the story of modern Manchuria. As the tide of immigrant farmers rises, it pushes the nomad people of the tents more and more back into Mongolia. Manchus tend to amalgamate with Chinese. By their dress one may still tell the women of the two races apart, but few foreigners can distinguish a Manchu man from a China man.

The new order affects the primitive Tatar tribes, just as white migration to our West affected the Indians. They tend to disappear. As Indians went with the buffalo, so the Tatar is vanishing with the sable, once his favorite quarry, and with the tiger, leopard, bear, and the much-sought wapiti and sika deer, whose green horns were good medicine.

The Tatars' end is sad, as is the end of every dwindling native race which fails to adapt its ways of life to those of the invader. Along the Amur and Sungari, remnants of the old tribes still hunt and fish.

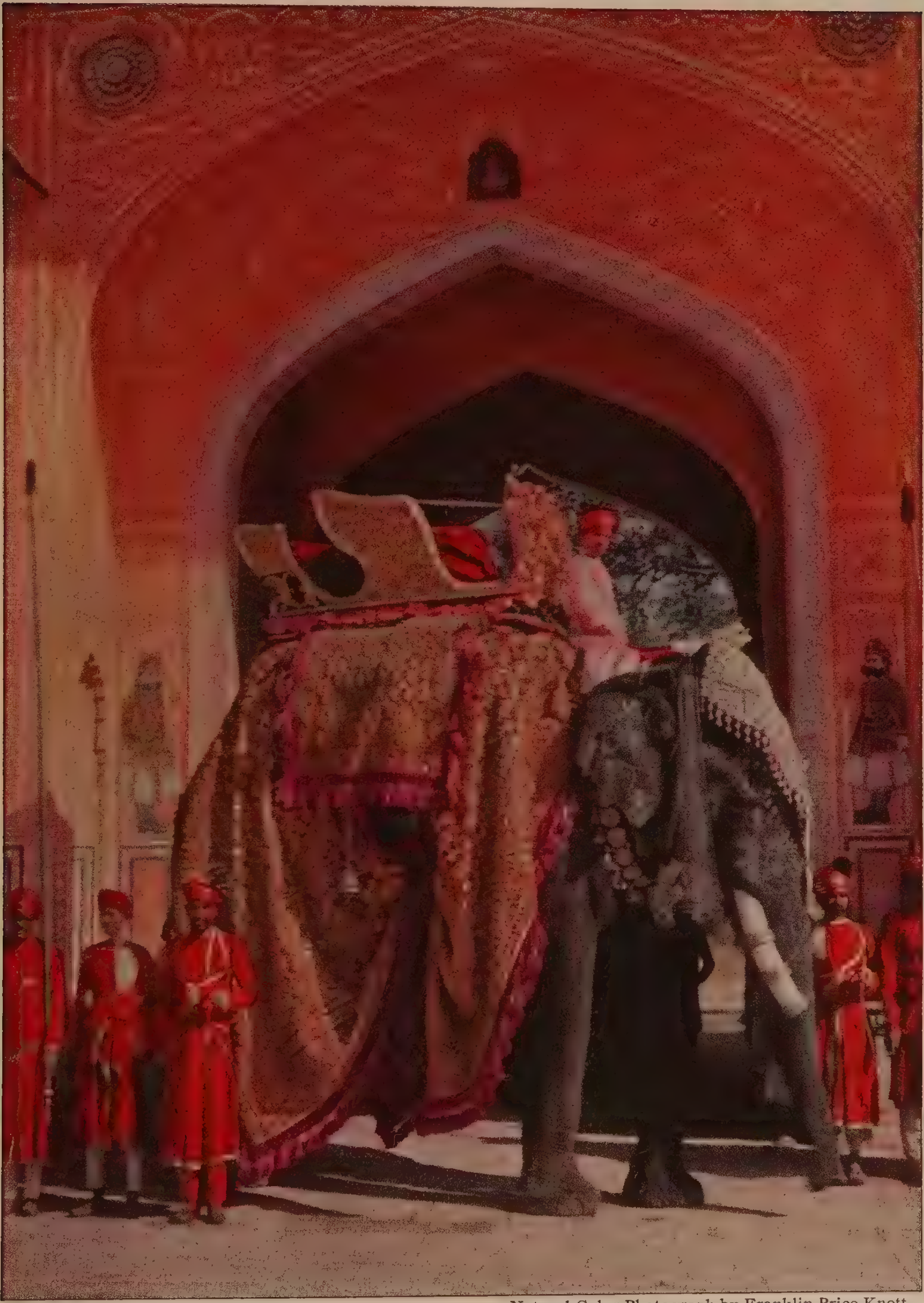
As late as the middle of the 19th century it was unsafe for whites, and even Chinese, to venture near the Tatar hunting grounds. But now their power is past. They are no more active in Manchurian affairs than Apaches in the trade, social, and political life of Arizona.

To-day, as a haven for Asia's surplus population, Manchuria is preëminently the home of Chinese; yet, because of its important map spot, where China, Russia, and Japan rub elbows, it is predestined to be one of those areas where tangled knots of conflicting interests make international problems.

That is why, year in and out, cables from the East carry news of Manchuria.

It is because the map of the world is shaped as it is; because the Bear wants a path to salt water; because the Dragon wants homes for surplus farmers; and because Japan wants a peaceful, prospering Manchuria *in statu quo*.

How to live and work, how to find a *modus vivendi* that is without detriment to any of those chiefly concerned—that is the problem in commercial and political geography that makes history now in Manchuria, where something is always happening.



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Natural-Color Photograph by Franklin Price Knott

"OUR LORD THE ELEPHANT," PANOPLIED FOR ROYALTY

Referring to the elephant's unsightly wrinkled hindquarters, Dickens said the animal employed the worst tailor in all the world! Yet, when decked out as only an Indian potentate knows how, in jewels, in velvets, in gold and silver trappings, he has no equal in sheer breath-taking gorgeousness. At Jaipur, before the Maharaja's palace.

THE LAND OF LALLA ROOKH—A SWITZERLAND OF THE EAST

Scenery, so thinks the Maharaja, is one of Kashmir's most valuable assets, and the one most likely to attract the foreign traveler to the Vale, "a valley of appealing loveliness, rimmed round with rugged austerity."

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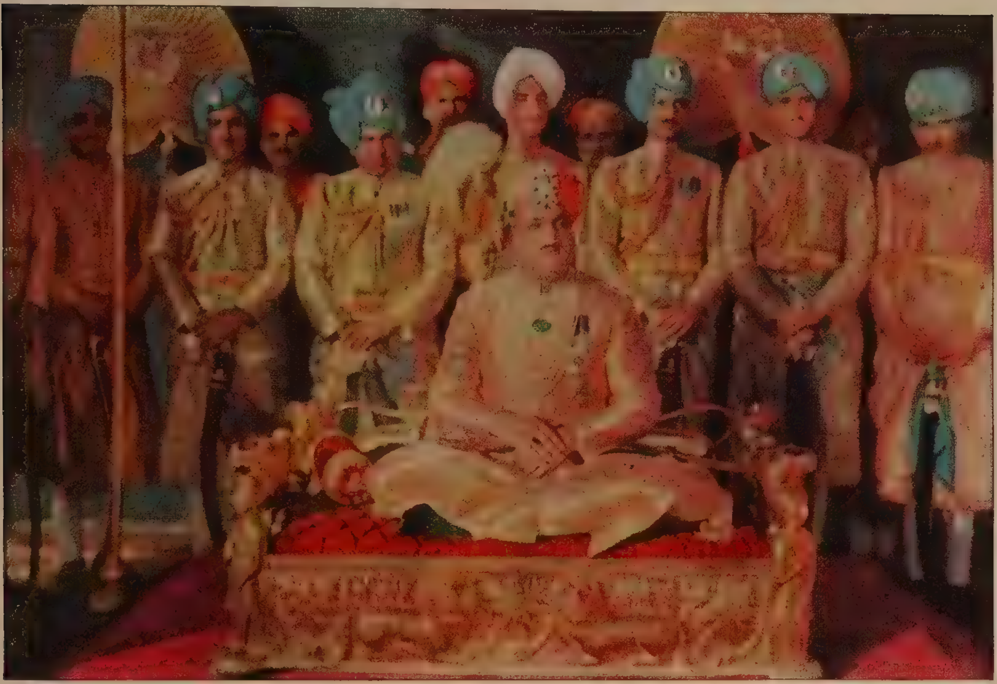
Natural-Color Photographs by Franklin Price Knott

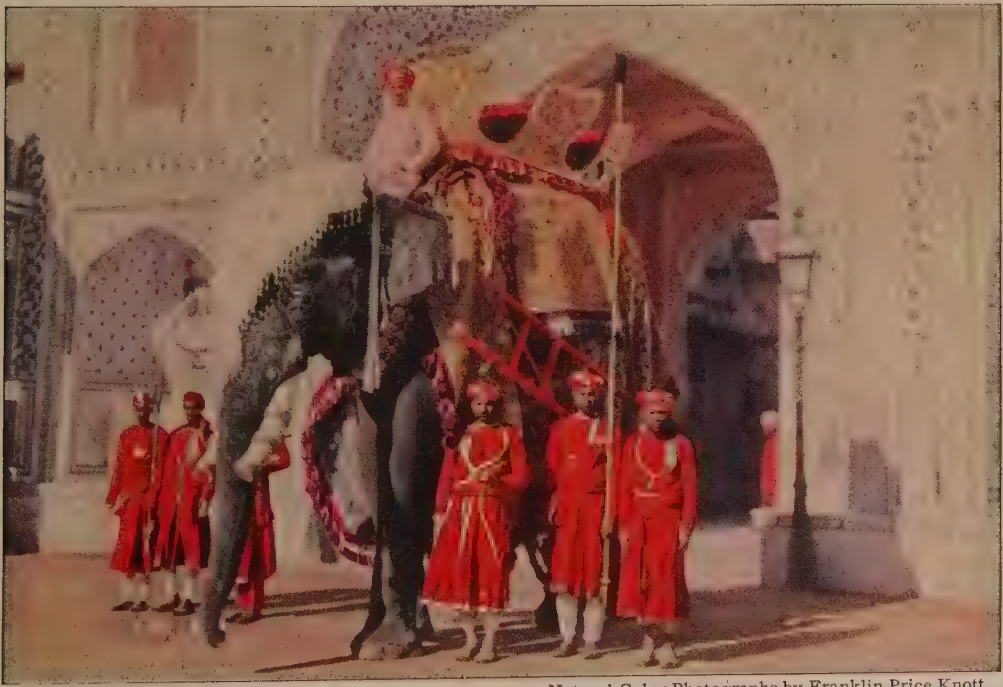
THIS KASHMIR SCHOOL TRANSFORMS ORIENTAL CHARACTER

The Church Mission School of Srinagar has taught its Hindu and Mohammedan students to tolerate all ranks and castes, to play, and to work with each other.



THE MAHARAJA OF JAMMU AND KASHMIR ON HIS GOLDEN THRONE

Colonel H. H. Maharaja Sir Hari Singh came to the throne in 1925. This picture, taken at his palace in Jammu, his winter headquarters, shows him in his coronation dress and surrounded by his personal retinue.



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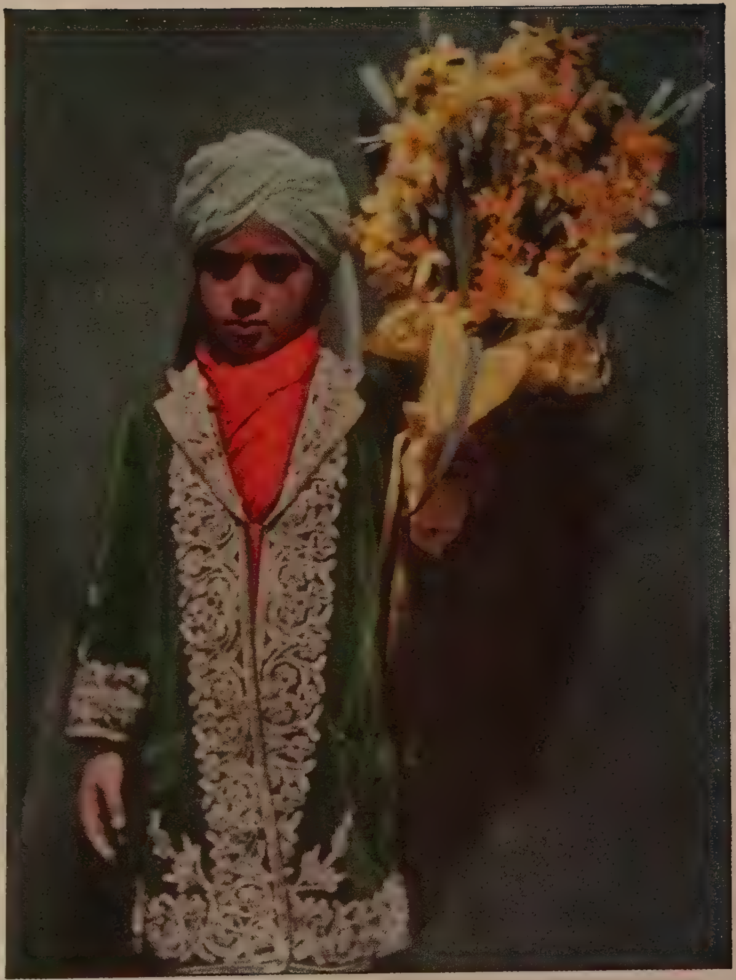
AWAITING THE MAHARAJA

In addition to his gorgeous trappings and inlaid ornaments, the royal elephant's forehead, trunk, and ears are usually painted in the patterns of a shawl (see also Color Plate I).



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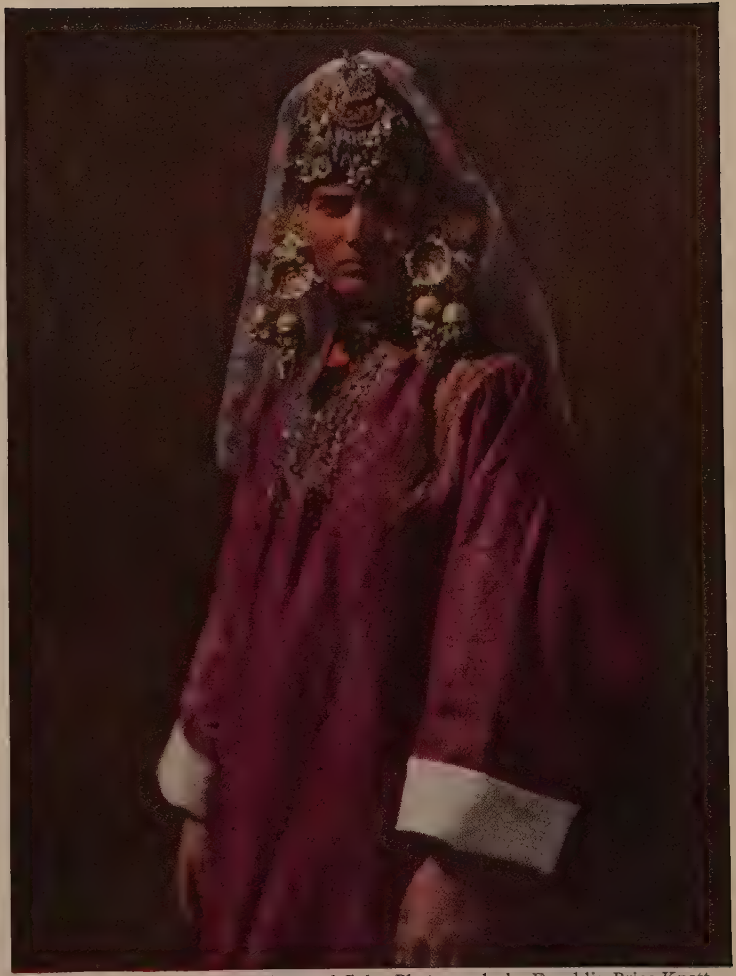
FLOWERS FOR INDIA'S CHIEF SAHIB

This boy from the Church Mission School at Srinagar is awaiting the arrival of the Viceroy and Lady Irwin.



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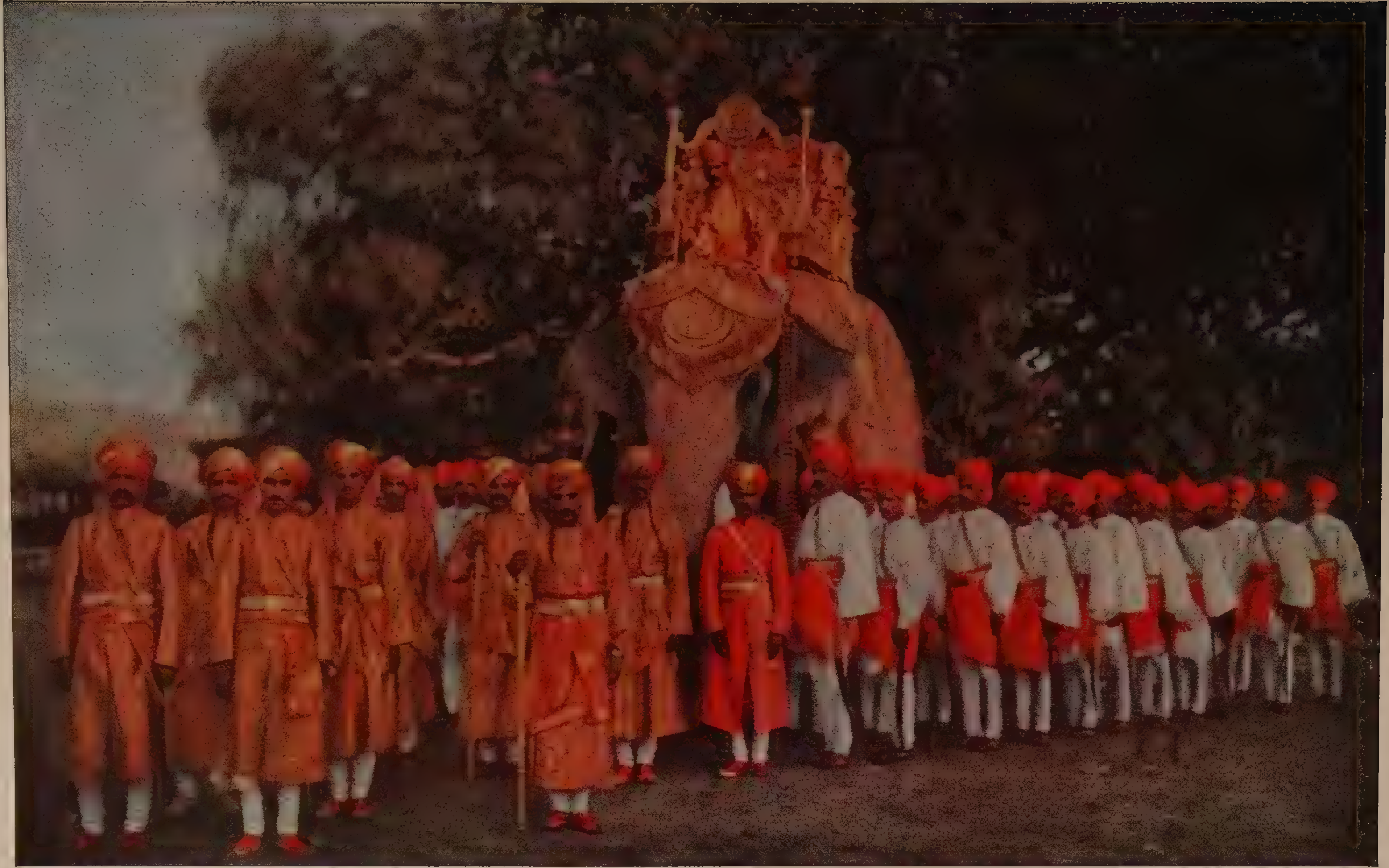
POETS SING HER LOVELINESS

Young, lithesome, her slim hands faintly hennaed, this Kashmiri dancing girl recalls the days of the legendary Lalla Rookh.



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THIS MAJESTIC ELEPHANT, SURROUNDED BY HIS ATTENDANTS, BORE THE MAHARAJA TO HIS CORONATION

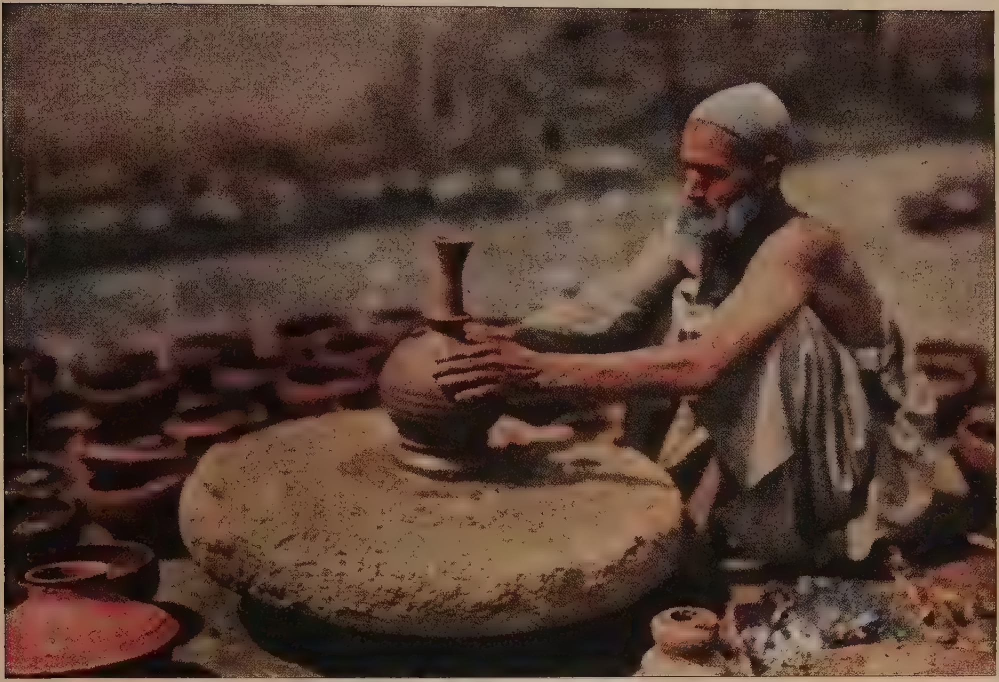
Some of the native princes of India maintain enormous palaces, armies of servants and retainers, and stables housing many richly caparisoned elephants, camels, and horses.

AFRIDI GUARDIANS OF THE AFGHAN BORDER

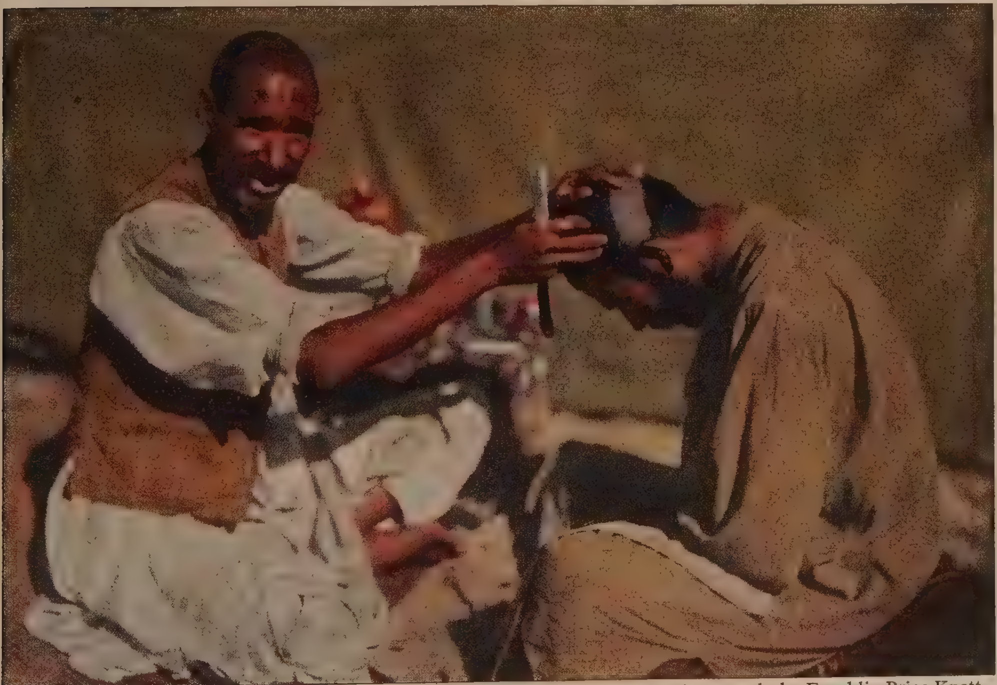
© National Geographic Society Natural-Color Photographs by Franklin Price Knott

THE AFRIDI MAKES A FIRST-CLASS FIGHTING MAN

Though some of the world's finest skirmishers on their own hills, and excellent soldiers in the Indian Army, these men usually grow homesick when away from their native mountains. Most Afridis live near fabled Khyber Pass, on the Peshawar border of the North West Frontier Province.



DEFT HANDS MAKE QUICK WORK ON THIS SRINAGAR POTTER'S WHEEL



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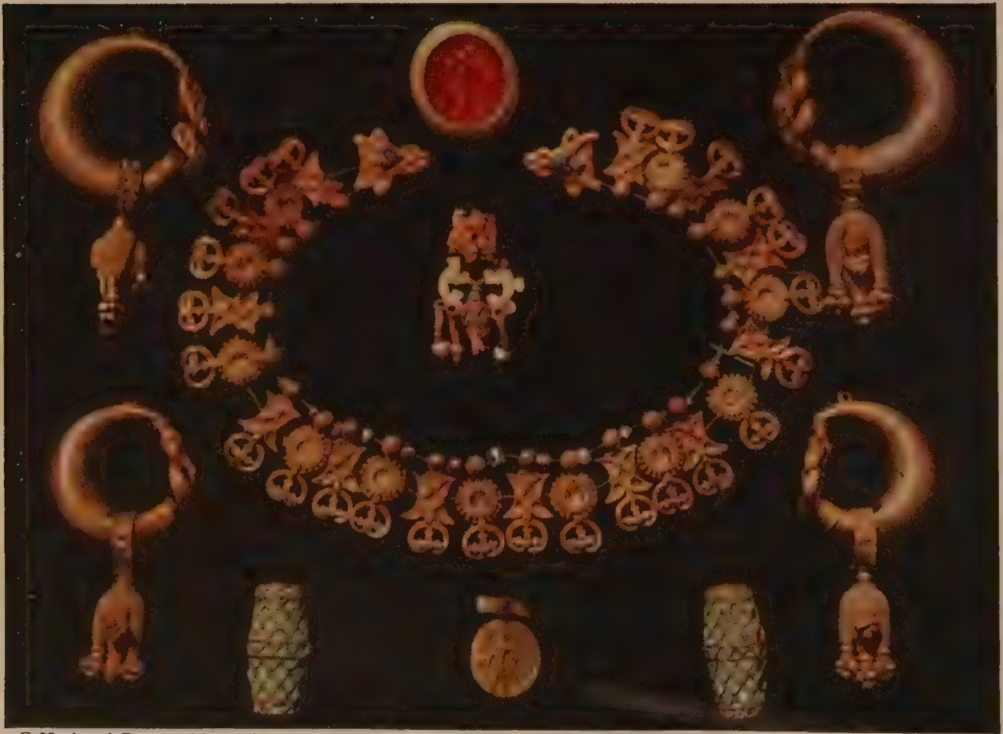
A TONSORIAL ARTIST OF KHYBER PASS

An Afridi barber goes by no rule in cutting hair. He can make a clean shave entirely across the head, or leave tufts of hair on top or at the sides. He is as expert with his steel as his wild fellow tribesmen are with their rifles (see illustrations on opposite page).

COCOONS KEEP THE WHEELS OF KASHMIR'S SILK FACTORY HUMMING

The establishment at Srinagar is one of the largest in the world, employing 5,000 men and women. Five filatures of delicate machinery, each 452 feet long, produce 1,200 pounds of silk a day.



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JEWELRY FROM TAXILA, WHERE ALEXANDER HALTED

The great Macedonian, eager to surpass the exploits of Hercules, Semiramis, and Cyrus of Persia, by a conquest of India, crossed the Indus 326 B. C. and advanced on this ancient capital and seat of Hindu learning, now in ruins.

HOUSE-BOAT DAYS IN THE VALE OF KASHMIR

BY FLORENCE H. MORDEN

With Illustrations from Photographs by Herford Tynes Cowling

THERE is magic in names. Who of us has not felt the lure hidden in such words as Samarkand, Peshawar, Khartoum, Peking—the far-flung places of the earth which call us in our hours of dreams? So I felt about Kashmir, that beautiful vale which lies in the lower Himalaya, north of the Indian Punjab.

One reaches Srinagar, the summer capital of the native State known as the Domain of the Maharaja of Jammu and Kashmir, over a long route by rail and motor. From Bombay one travels northward by train, via Delhi and Lahore, to Rawalpindi, one of the chief army posts of British India. There the way to beauty opens.

Almost at once on leaving Rawalpindi the motor road begins to climb. Up and up through the deodar-clad slopes of the lower mountains the road twists and turns, the heated air of the plains grows cool and invigorating, until, when we made our first overnight stop at Tret, we felt we wanted to laugh and sing.

Everything amused and interested us. We had landed in India only a few days before and all this Eastern world was new to us. Ruffled punkas swung from the ceiling, though we had no need of them. Our deft and turbaned servants pattered barefooted about the rooms, unrolling our bedding on the stringed *charpoys,* the fairly comfortable beds of India. Even the not-too-bad food served by the bungalow cook was a matter for hungry jest.

Lovely, lovely world, with a summer of Kashmir ahead.

BY MOTOR TO KASHMIR'S CAPITAL

The road from Rawalpindi to Srinagar is a well-built motor road, some 200 miles long, and it lies through the mountains north of the Pir Panjal Pass. Snowy peaks rose high above us. The rushing waters of icy streams chattered noisily below. Hairpin turns in the road made me catch my breath and curl my toes, for the ways of the native driver are his own and without fear, and, alas, I had not the knowledge of his language wherewith to express my feelings.

Soon, ah soon, from the first traveling Sahib, I learned to say, *"Ahista, ahista!"* But I never succeeded in making an Indian chauffeur drive slowly, slowly.

MUD ROOFS ABLOOM WITH IRIS

It is possible to make the trip to Srinagar in a day, but not ahista! Quite the contrary. We spent two nights in dak bungalows (resthouses) along the way, the second at Baramula, which lies at the edge of the great depression known as the Vale of Kashmir.

From Baramula one can go the rest of the way by boat, up the Jhelum River; but we preferred to drive. The last 35 miles lie across a level stretch, the road bordered on either side by slender poplars. It was in April and the peasants waded knee-deep in the paddy fields.

The mud roofs of the flat-topped houses were abloom with irises, purple and white, with slim green leaves. The people we passed along the way were quite different from those we had seen in India. *Ekkas* and *tongas,* the two-wheeled horse-drawn vehicles of the country, drew aside to let us pass. I know of no delight equal to drinking in the first sights in a foreign land.

The Vale of Kashmir is a level valley about 80 miles long and averaging about 20 miles in width. It lies, a great oval, surrounded by mountains green with deodar and spruce on the lower reaches and white with snow above until well into the early summer. Skies of an incredible blue complete a color scheme of fairy loveliness. Throughout the valley winds the curving line of the River Jhelum, along the banks of which straggle the streets and bazaars which form the ancient city of Srinagar.

Seven curious bridges span the river, and along the shore quaint old wooden houses lean sometimes at a rakish angle. Many of the city streets end in wide stone steps leading down to the river's edge. These stairways are usually animated scenes of native life. Here the laundry-

AFTERNOON TEA ON THE UPPER DECK OF THE "MELISANDE"

Usually some English friends, on leave from lower India, would drop in to chat with the Americans. Old Glory flies because it happened to be Decoration Day (see, also, text below). Though the Kashmiri is a skillful boat builder, he did not invent the house boat. It was introduced into the country some 40 years ago.

men wash the clothes; here the women come to fill their water jars. Children tumble and play about, and goats and cows ramble freely among them all. From the overhanging balconies lengths of dyed pashmina (see page 452) hang out to dry. All is colorful and gay.

MANY OF SRINAGAR'S INHABITANTS LIVE AFLOAT

Also there is the interesting river life. A large part of the population of Srinagar lives afloat. Odd, long, pointed boats, called *dungas,* with a superstructure hung with mats of woven reeds, are the only homes which thousands of Kashmiris ever know. Sleeping quarters within, a kitchen of sorts open to the eyes of all, a few pots of brass or copper, and a poor Kashmiri's household is complete.

The native of more ample means has a better boat. Walls of wood replace the woven mats, and as better and better financial status is indicated, so the boats improve. The best are comfortable and well-furnished house boats, such as one might see upon the River Thames.

The English have made their contribution in the development of the house boat in Srinagar; for the Vale of Kashmir has become not only a favorite vacation land for the English Army in India, but the permanent home of many retired officers and their families.

When we first arrived we took a temporary boat; then arranged to take over

"PALE HANDS I LOVED, BESIDE THE SHALIMAR"

Against a background of falling water, a Punjabi girl dances on a stone platform rising from the green swirl of a flowing stream. In these stately pleasure gardens near Srinagar, on a corner of Dal Lake, the great Mogul emperor Jahangir and his favorite wife, Nur Mahal, spent many a delightful summer day (see text, page 461).

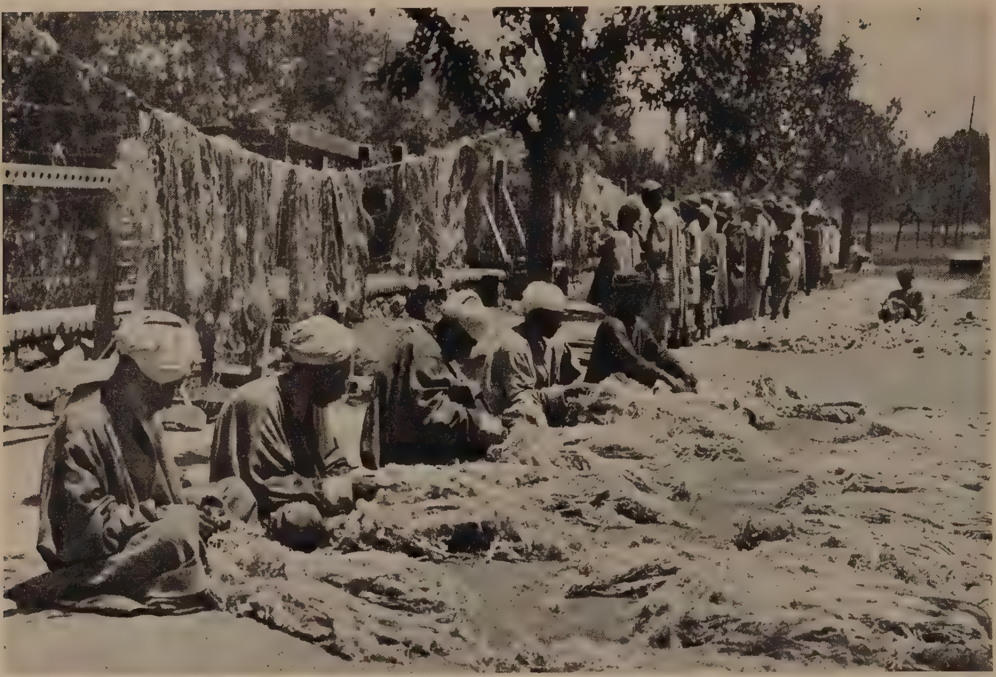
the delightful house boat which was the year-round home of an English colonel and his wife.

It was while on the shabby little temporary house boat that I had my first experience in dealing with the native servant. On Colonel T——'s boat I was to take over all the servants except the cook. There was a cook attached to the first little boat, but our meals there were awful. So I decided not to take to the new home such a poor specimen as the toothless, turbaned object I had seen hovering over the stove in our queer little kitchen. Calling him before me, I explained through my bearer, who spoke English of sorts, that I was moving to T—— Memsahib's boat, would have T—— Memsahib's servants, and that his services would not be required.

He protested with a flow of tears and strange words, but I was firm. Reluctantly he disappeared in the direction of the cook boat. Soon at the gangplank leading to our door appeared a native, turbaned and shod as for the street. He held out to me his book of chits, or references. Through my English-speaking bearer we talked, and as his references were good I engaged him. He was to come next day to T—— Memsahib's boat.

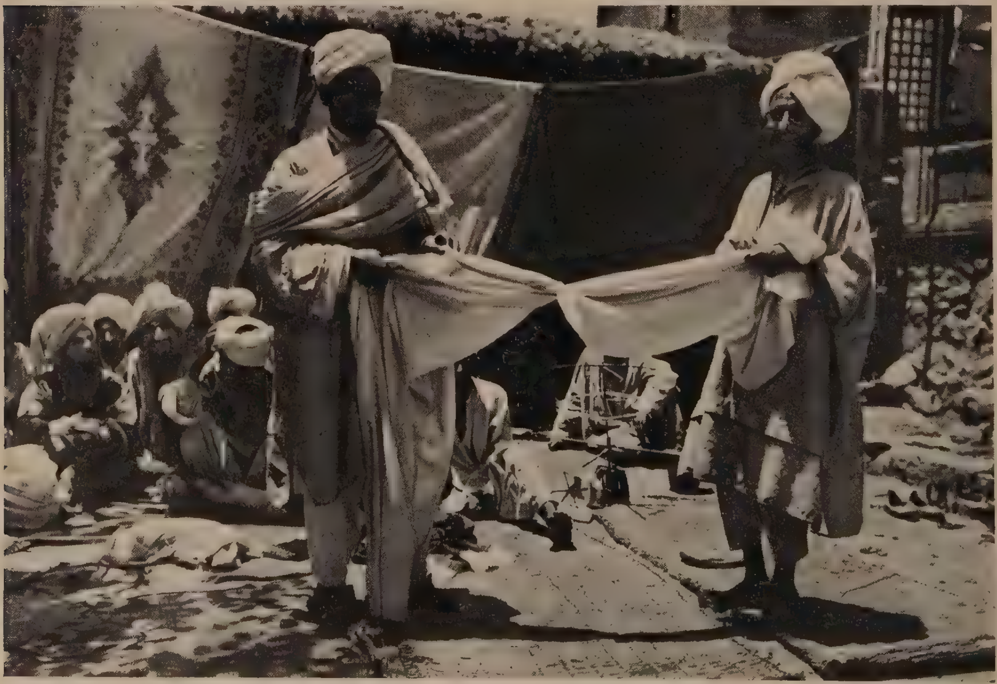
When we moved on the morrow my toothless failure from the cook boat started to follow. More tears; more language; more firmness.

The next morning, at T—— Memsahib's



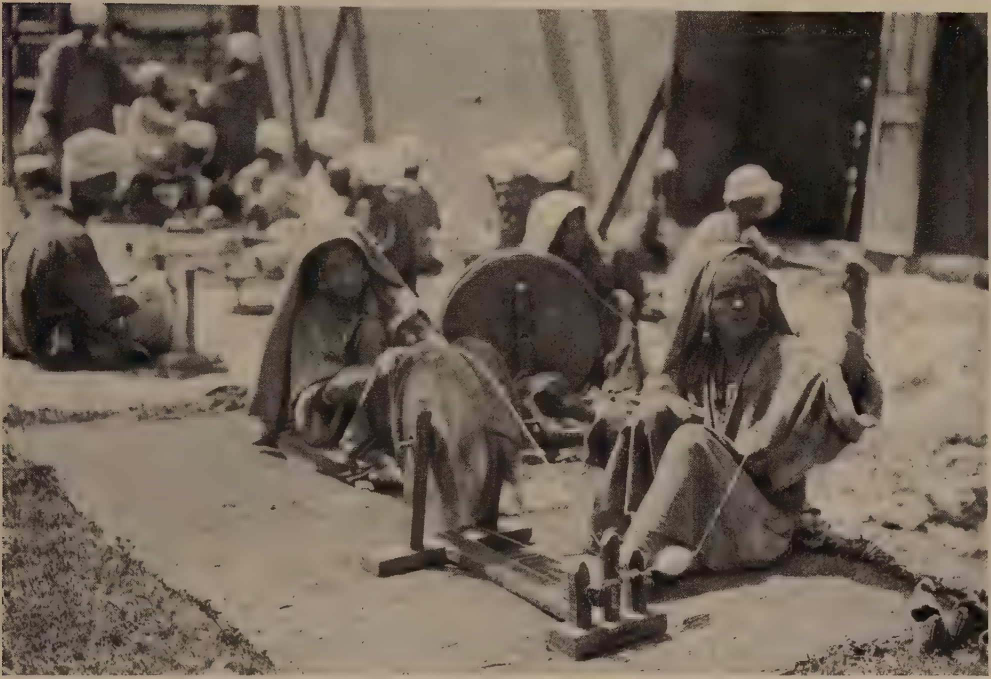
NONE OF THE COCOON IS WASTED

Only part of the fine thread forming the silkworm's cocoon can be unwound in the tepid baths; the balance is here being pulled or shredded into a soft tangle known as spun silk.



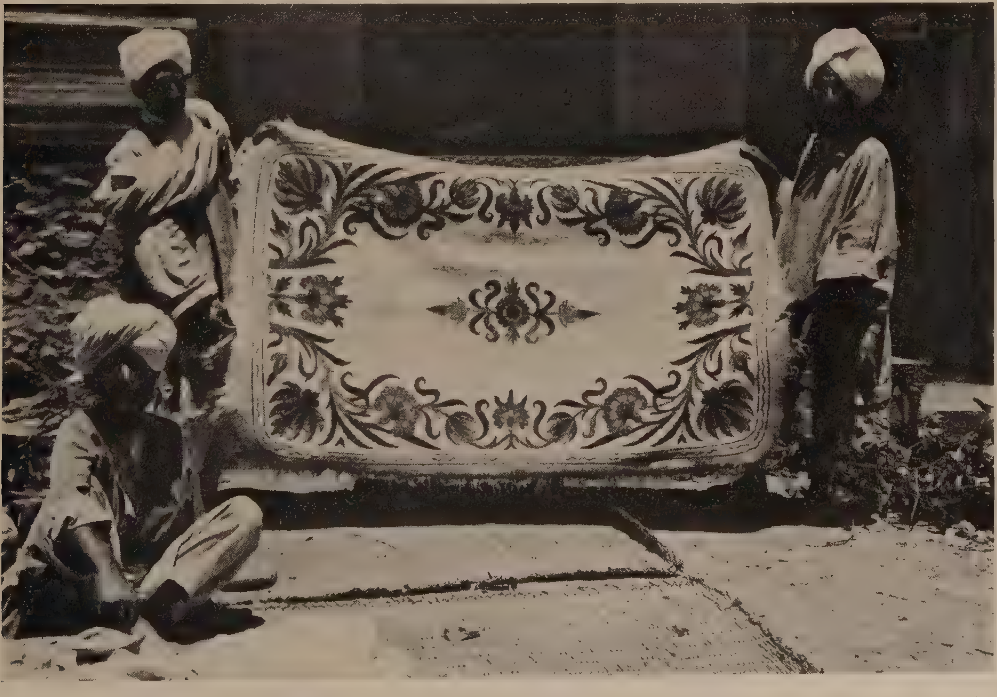
IN THEIR HEYDAY, KASHMIR SHAWLS KEPT 16,000 LOOMS HUMMING

To show the fineness of their wares, these merchants draw the *pashmina* through a finger ring—hence the term "ring shawl." Kashmir's famous industry, dating from the beginning of the 16th century, is almost extinct to-day, but at one time it employed more than 25,000 persons. Napoleon made these glowing textiles popular when he gave some to Josephine.



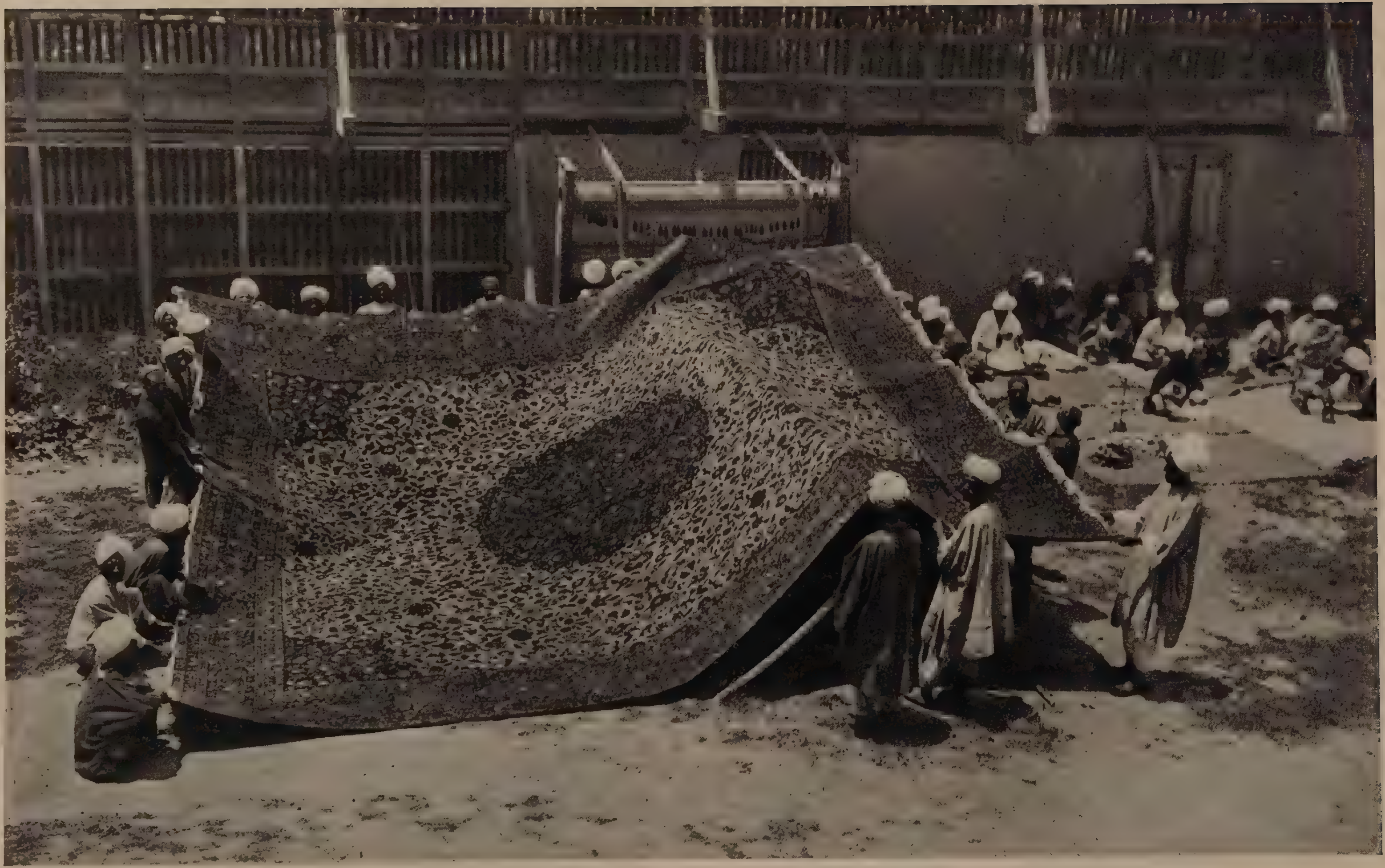
CRUDE WOODEN WHEELS OBEY THE TOUCH OF DEFT FINGERS

Women spin the soft, woolen thread that goes into the making of the rugs for which Kashmir is fast becoming famous (see, also, illustration, page 442).



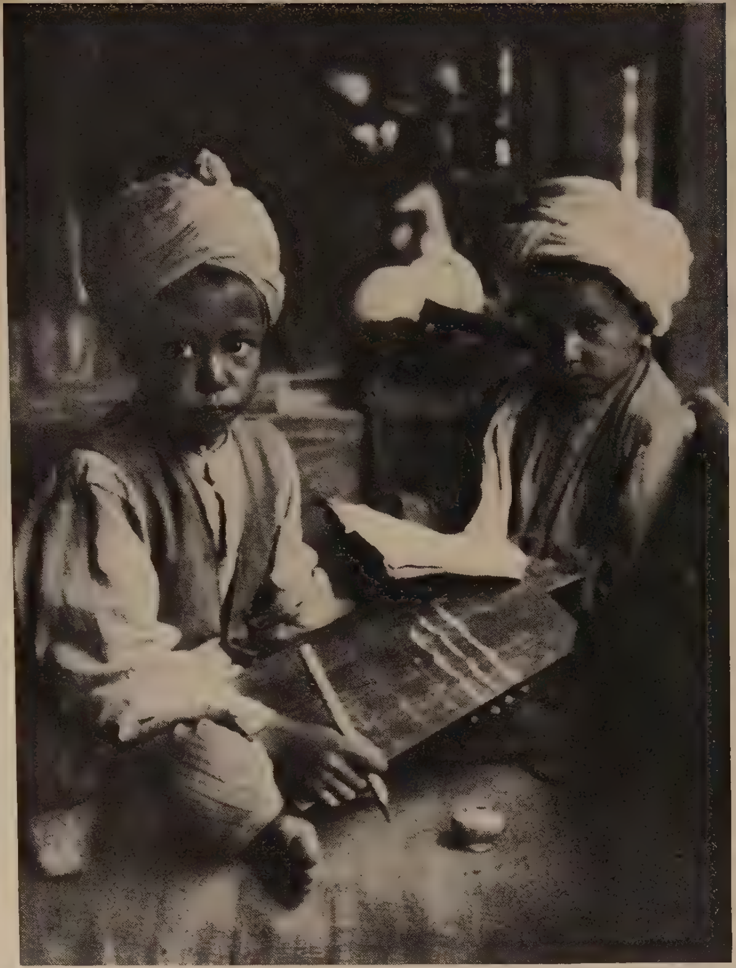
THE CENTRAL ASIAN NUMDAH—A MINOR TRADE LINK BETWEEN EAST AND WEST

Such coarse felts, used by some Chinese Turkestan tribes for rugs, boots, blankets, and tent coverings, now find a ready sale in England and the United States. Many are sent to Kashmir to be elaborately embroidered, for some of the shawl workers, after the death of the more famous industry (see page 445), took up this newer work.



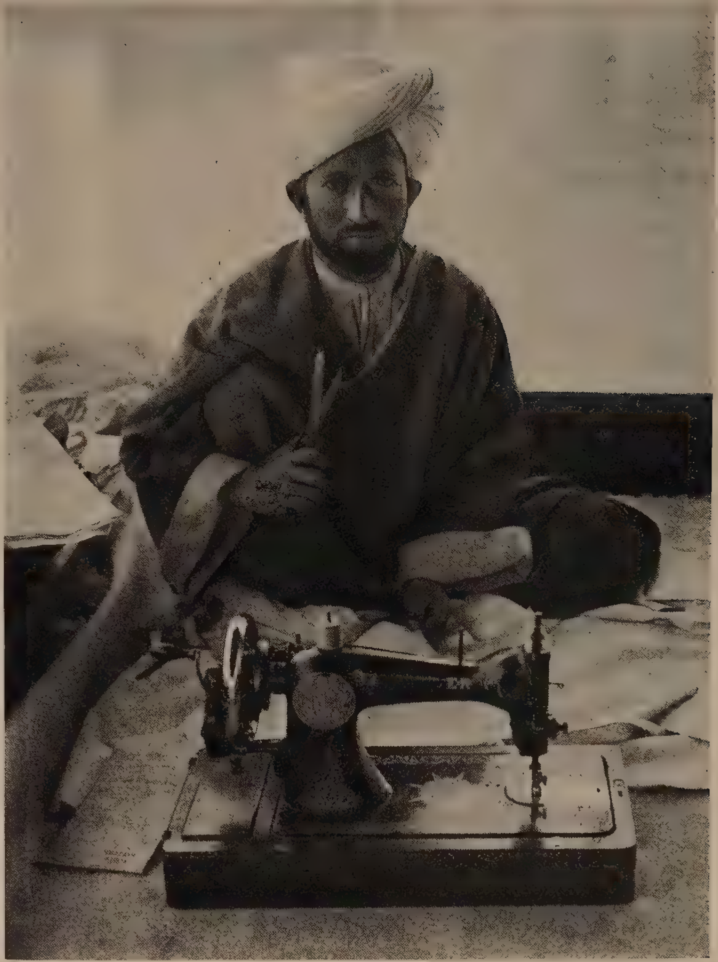
WHEN THE KASHMIR SHAWL WENT OUT OF FASHION, THE KASHMIR CARPET TOOK ITS PLACE

The finished rug of excellent quality and design has just been taken from the loom. Almost the entire output of this concern goes to a Chicago store. In Kashmir the dyes are good, and the finest wool is obtainable, much of the *pashm* (the soft under wool of the Tibetan goat) formerly used for shawls now being used as a basis for the best grades of carpets. Many of the old shawl weavers now exercise their skill upon these newer products.



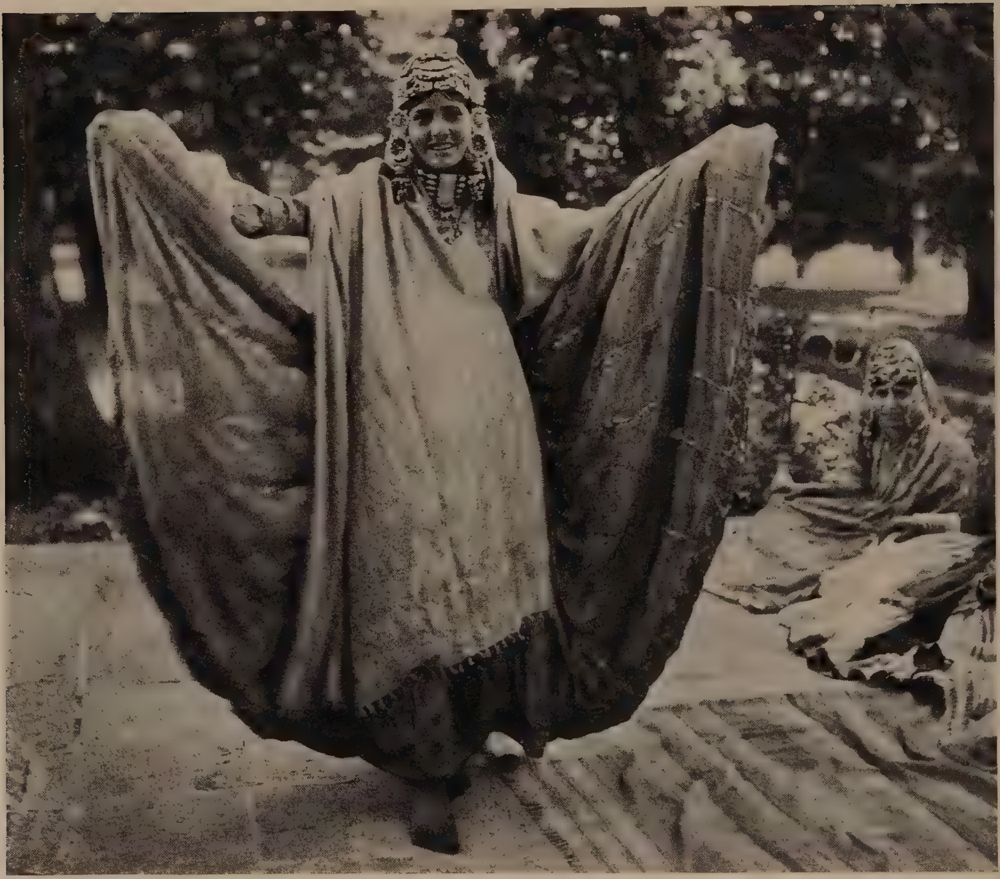
THE THREE R'S IN KASHMIR

With brush and paint pot, lads struggle to master the characters of their native language. The letters resemble elaborate shorthand notes. The schoolboy's slate is a board smoothed with a piece of glass, his pen a stalk of Indian corn, and his inkwell a bottle holding chalk and water.



"DHURZI" SEWED CHEERILY AND WELL

The author's needleman squatted daily on the rear deck of the *Melisande* with his little American-made, hand sewing machine before him. His embroidery was excellent and his drawn-work the envy of all foreigners (see, also, text, page 445).



IN ALL THE CHARM OF HER NATIVE COSTUME

The headdress of this Kashmiri dancer is a gold-embroidered cap incrusted with many jewels and hung with heavy pendants, which give the effect of earrings. The high, close-fitting collar is also jeweled.

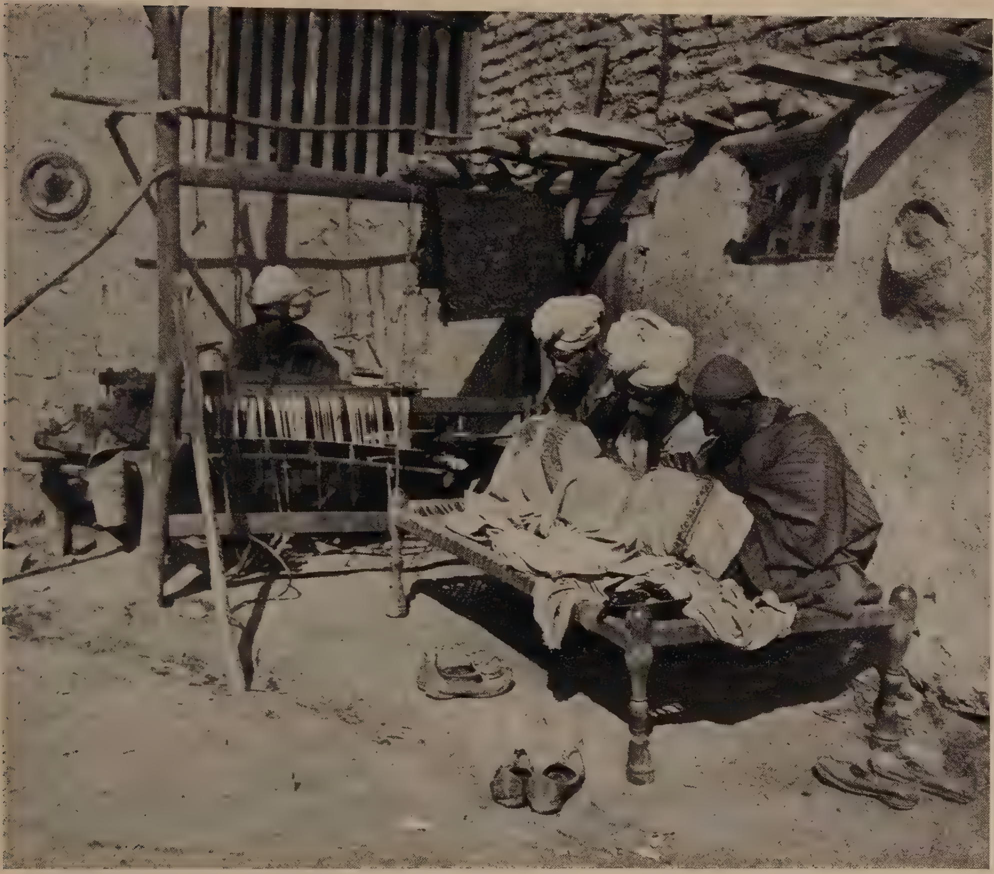
boat, no cook appeared, and I sent my boy posthaste to know the reason. He returned with a much-beshawled individual in tow, who promptly took possession of the new cook boat. It was about a week later that I learned that they were one and all the same cook. By native wit he had played upon the fact that to a new arrival in a strange land all natives look alike. As my sister said, "He came in one door and was fired; in another and was hired—fired, hired; hired, fired!"

ELEVEN SERVANTS FOR THE WAGE OF ONE

But eventually he became a fixture, and, strange to say, in the better surroundings of our English floating home, proved a most excellent cook.

Our new house boat, the *Melisande*, was delightful, and we settled easily and happily into the life of the place. We had ample room. Our living room boasted a piano and a tiny open fireplace—luxuries indeed. The dining room could seat six with comfort. A single and a double bedroom, with bathrooms adjoining, gave us all the sleeping space we needed. An upper deck, with easy chairs about, made an ideal lounging place (see page 438).

To the rear swung the cook boat, so that none of the odors of food or chattering of servants disturbed us. Flowers we had in abundance and birds sang everywhere. Early in the morning and at dusk the full-throated note of the bulbul lent its incredible sweetness. The river slipped past our mooring with ever-changing charm.



THE SUPERB NEEDLEWORK OF KASHMIR IS DONE BY MEN

Embroiderers, sitting cross-legged on a stringed *charpoy* (a kind of light bed), feel no lack of dignity in their task. The work may be on wool, silk, or cotton, and usually reflects rare taste both in color and design.

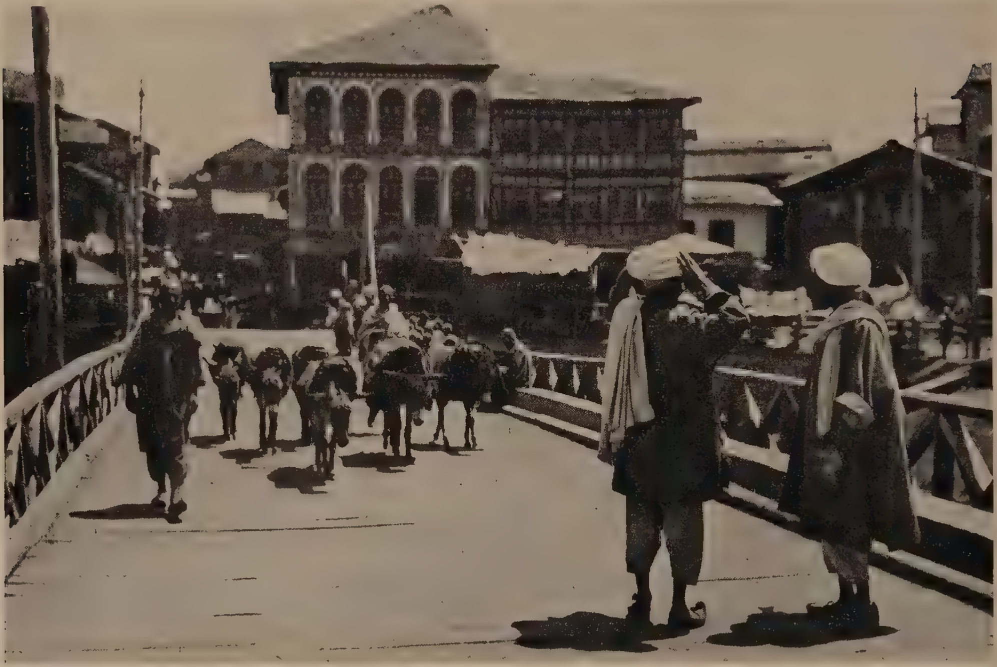
One lives easily in Kashmir. The host of servants we had cost about as much as one good cook at home, and they feed themselves. Each one has his appointed duties and does them fairly well.

HOUSEHOLD SERVANTS ARE ALL MEN

All our servants were men. The women of Kashmir seldom work out. Even the little children frequently have men servants to care for them. Our list was as follows: *mangi,* or head boatman; *khitmatgar* (chief house servant), assistant khitmatgar, *bhisti* (water-carrier, sweeper — of lowest caste and doer of menial jobs), *khansaman* (cook), *dhobi* (washerman), *dhurzi* (sewing man), *mali* (gardener), and three little *chhokeras,* the small boys who paddled the *shikara,* a small gondola-like boat in which we went everywhere. It seems an ample list.

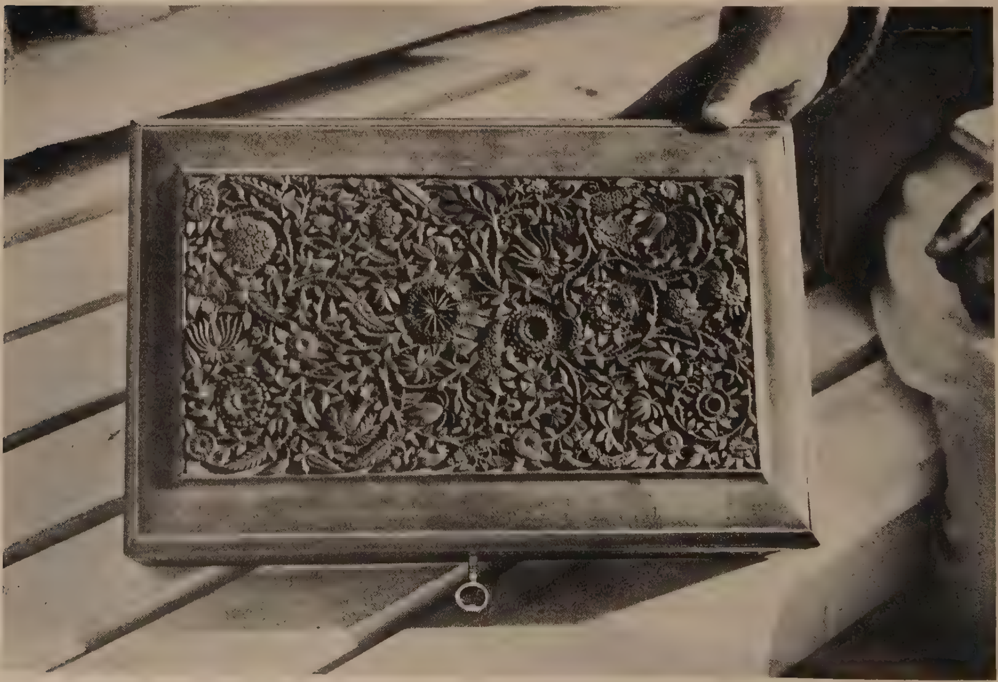
We had many amusing times with the lot of them, as I am sure they had with us. My khitmatgar, Aziza, and the dhurzi, Mohamad Khan, were my two favorites. The latter, a devout and bearded Mohammedan, squatted daily on the rear deck of the boat, a little hand-operated sewing machine in front of him, and sewed and sewed (see page 443).

His handwork would have done credit to a convent and he could copy anything. Both outer and underclothes, drawn-work, and embroidery he could turn out with ease. I have seen him, when needing a seam held taut, catch a fold between his bare brown toes, leaving both slim hands free for more intricate action. His turban



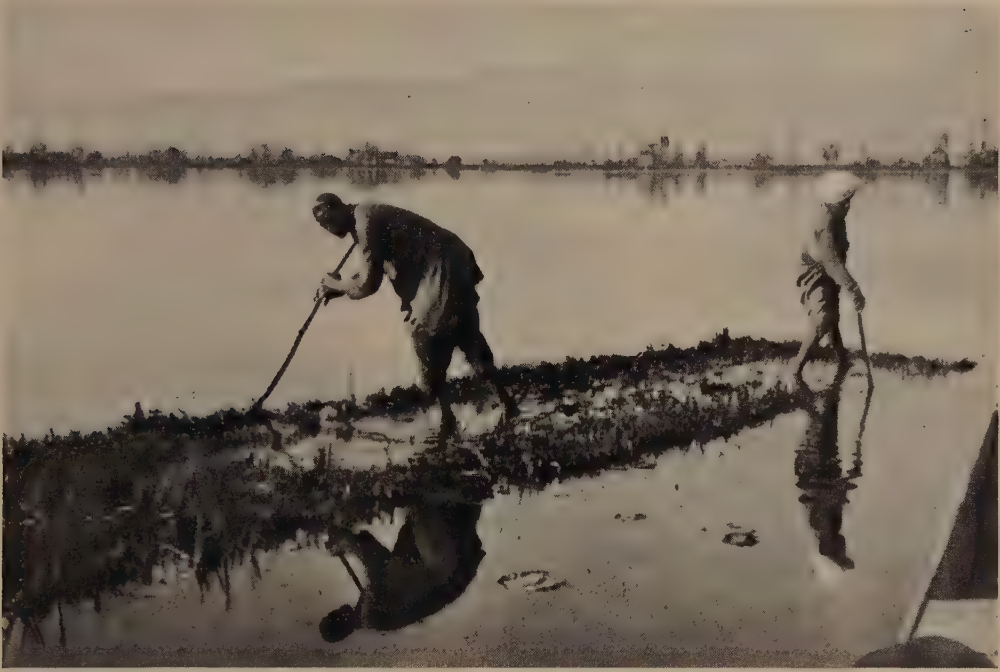
SRINAGAR, THE CITY OF THE SUN, SPANS THE JHELUM WITH SEVEN BRIDGES

Old-time chronicles speak of an enormous number of houses in the capital of Kashmir—as many as 3,600,000—and of five-story pine-wood mansions, with apartments, halls, galleries, and towers reaching to the clouds. To-day its most notable feature is its jumble of rickety wooden houses, royal palaces, balconied shops, rich tradesmen's homes, mosques, and temples—all with a foreground of sweeping river and a background of snowy mountains.



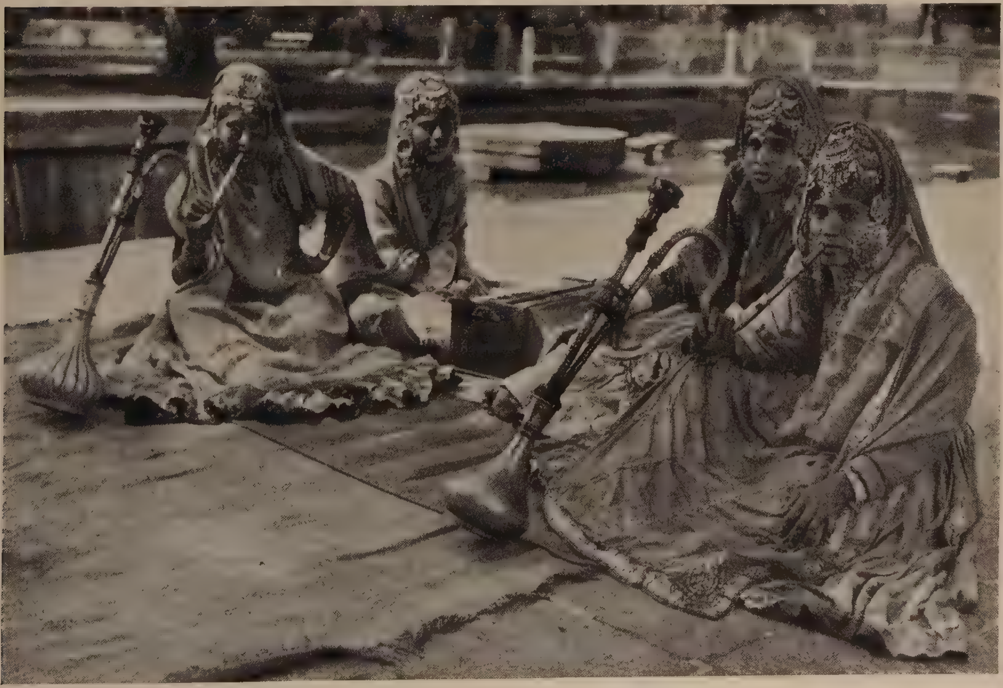
WEEKS OF PAINSTAKING LABOR GO INTO THE MAKING OF SUCH A BOX

Wood-carving is one of the arts of Kashmir, and handsome boxes, panels, screens, and tables may be purchased in Srinagar's bazaars.



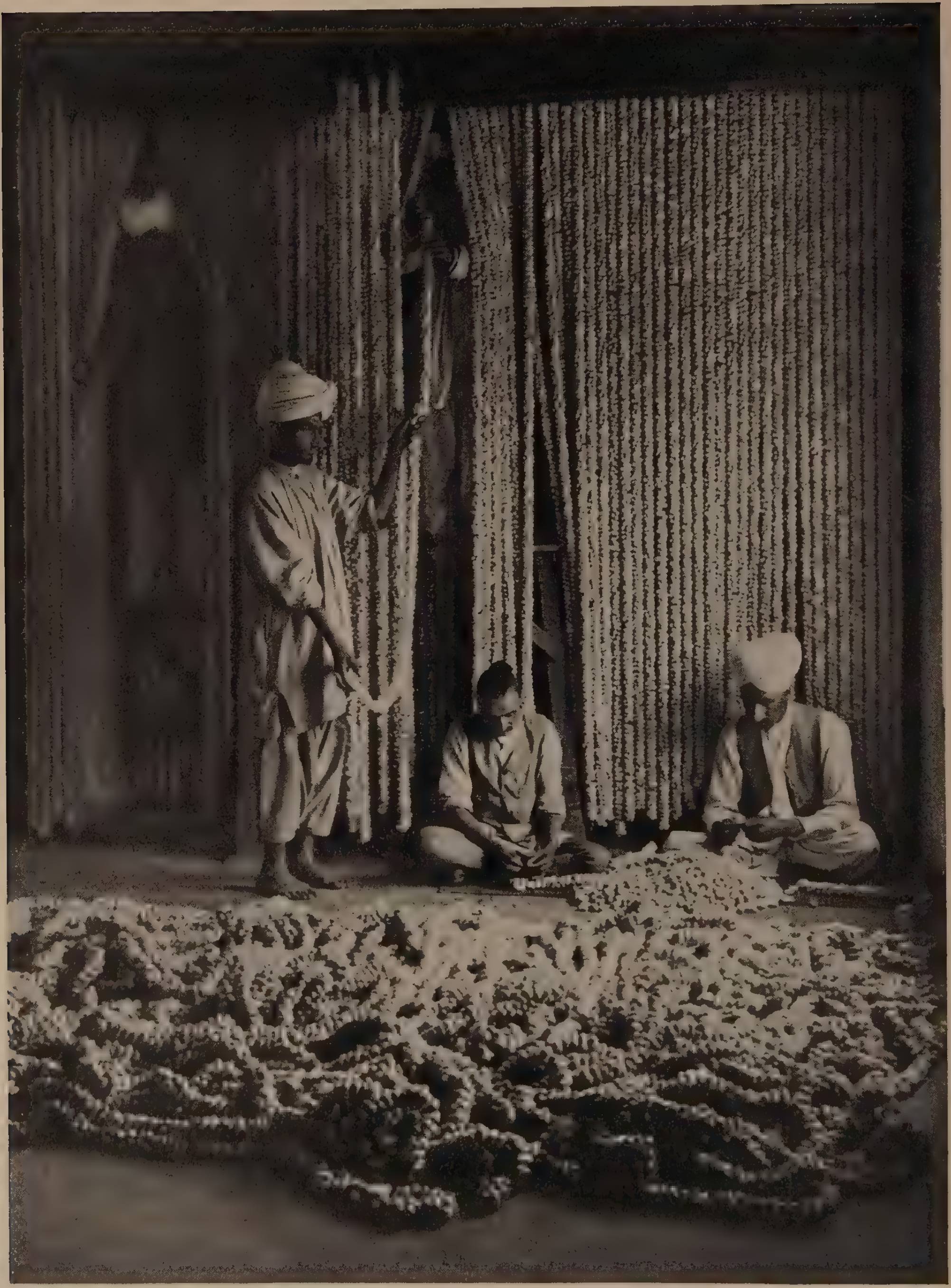
A BIT OF FLOATING GARDEN BEING POLED ACROSS DAL LAKE

It will be tied to a boat or to stakes driven in the lake bed. Then seeds will be planted in the rich soil which has been dug up from the bottom of the lake, and which is held together with a network of fine twigs. These gardens are similar to the *chinampas* of Lake Xochimilco, in Mexico (see "The Venice of Mexico," by Walter Hough, in the NATIONAL GEOGRAPHIC MAGAZINE for July, 1916).



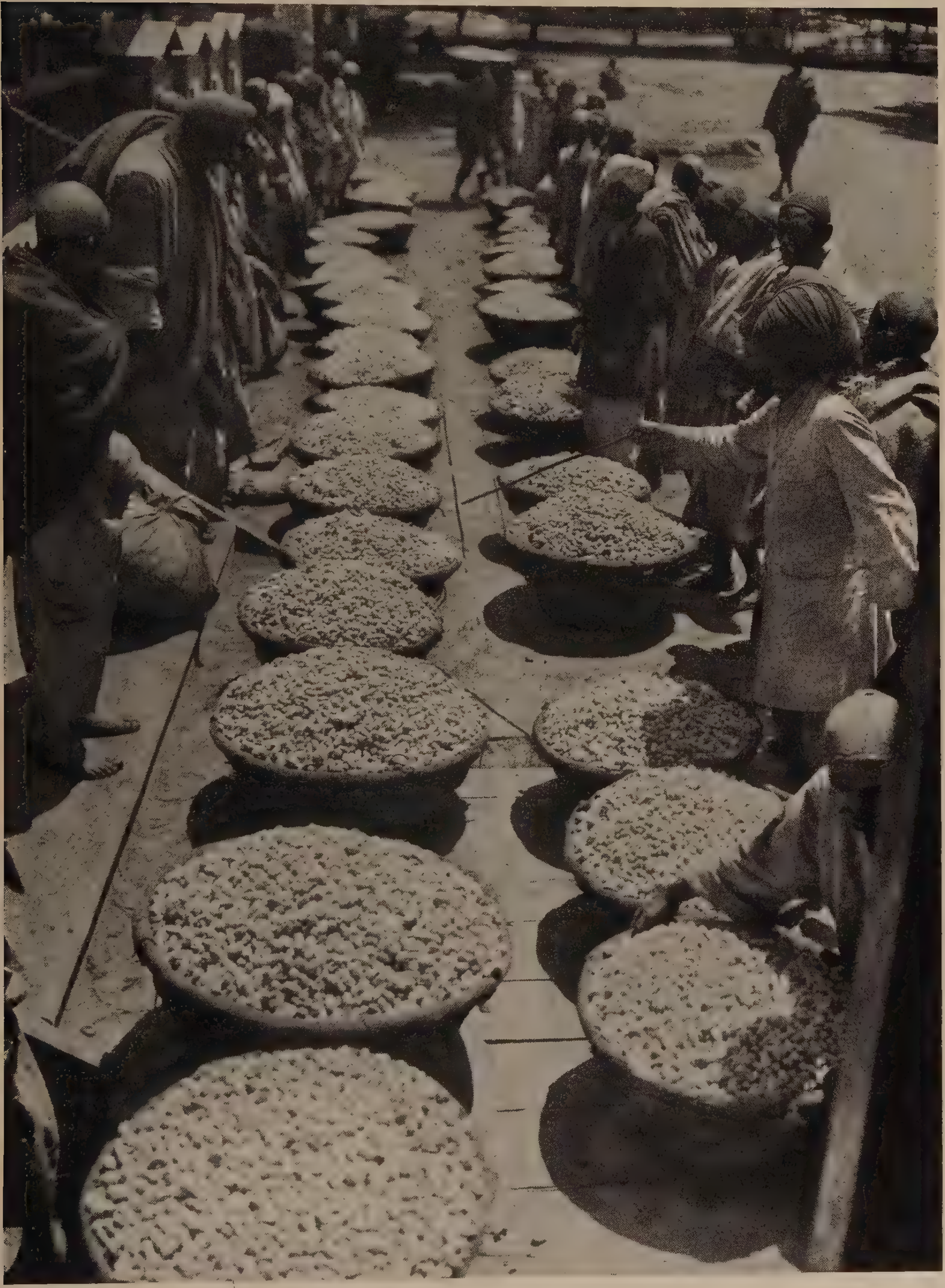
THE USE OF THE HOOKAH IS NOT CONFINED TO MEN

Sometimes these mammoth water pipes are beautifully made and elaborately decorated with gold and silver inlay.



STRINGING COCOONS IN A SILK FACTORY

These silky envelopes have been selected to maintain the supply of breeding moths. They are carefully strung and kept at a constant temperature for a while, and the pupa, instead of being killed by steeping in acid, by steam, or dry heat before the cocoon is reeled off as silk, is allowed to develop into a silkworm moth. When the winged wonders emerge from the envelopes, they are captured and cared for, as every one of them is a source of income, now as in the old days when Kashmir furnished some of the Bactrian silk which found its way to Damascus.

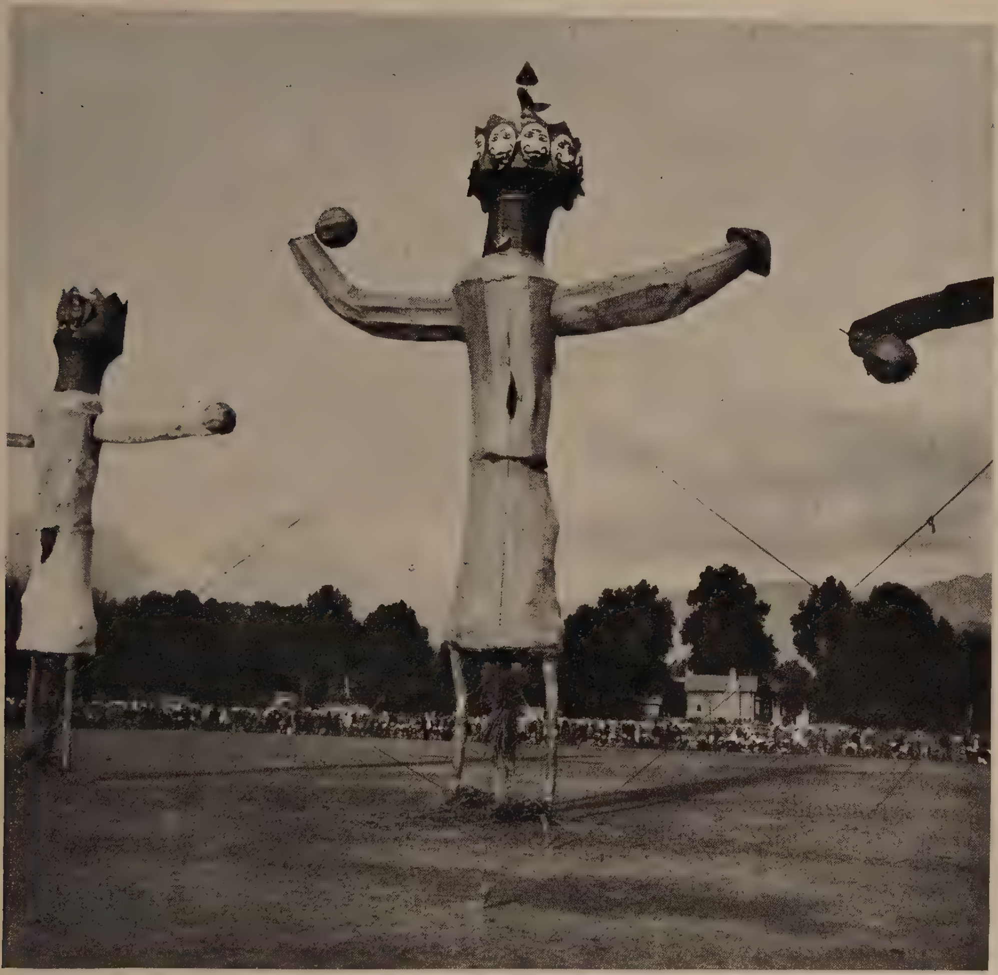


THE SILKWORM WAS A GIFT FROM CHINA TO INDIA

There is a tradition that a Chinese princess concealed mulberry-tree shoots and silkworm eggs in the lining of her headdress and smuggled them to India. In Kashmir, silkworms are farmed out. Only when the cocoons are ready to be transformed into soft, fine threads do those who have cared for them bring in the baskets, piled high with prospective income. The baskets are weighed, and each man gets a ticket showing the weight of his offering, which is later turned into rupees and annas. Most of Kashmir's silk is sent to England to be woven.

A MISTRESS OF POTS AND PANS IN KASHMIR

Her household enjoys many of the vegetables seen on Western tables, such as tomatoes, cucumbers, eggplant, turnips, and potatoes. Her pots also contain plants that are seldom eaten in other parts of the world, such as thistles, nettles, walnut catkin stalks, wild asparagus, and wild rhubarb cooked in honey.



THIS 10-HEADED DEMON KING OF CEYLON WILL GO UP IN SMOKE

Once a year in Srinagar the Hindus burn in effigy the giant god Ravana, with his brother and son. These three stole Sita, the wife of Rama, and held her captive in Ceylon. Rama and his brother hunted far and wide for her; then Hanuman, the monkey general, found out where she was. Hurling huge rocks and trees into the sea, his followers built a bridge to Ceylon, across which Rama, with an army of monkeys and bears, marched to the attack, and to the subsequent rescue of Sita. The burning in effigy of these figures recalls the helpfulness of Hanuman and is accompanied with much religious fervor. The passageway the monkey built for Rama across the straits—the so-called Adam's Bridge—is still known in India as Rama's Bridge.

made a convenient pincushion, and there were generally long, varicolored threads hanging down before his eyes.

Dear, patient, fine-sewing dhurzi, I wish I had you squatting cross-legged on my premises now! I would not then be paying exorbitant prices for indifferent work.

THE HEAD BOATMAN MANAGES EVERYTHING

Aziza was an English-speaking lad of pleasing manners and appearance. Everyone said, "You must watch your khitmatgar. He does all your marketing and he will cheat you surely." Did you, Aziza, here and there? But you were a wonderful joy to me, and, though I am sorry if you were not strictly honest, how can I grudge a few annas to one who gave so much in return?

If we took guests for tea to Shalimar Gardens, it was Aziza who went along and served a perfect meal under the spreading chenar trees. When I planned a morning in the bazaars, Aziza followed respectfully behind, my guide, translator, and willing slave. My days were carpeted with ease and my floating home was a joy to me, thanks to the willing service of Aziza.

Where but in Kashmir could one call back, as one was leaving home for all day, "Aziza, we will have guests for dinner to-night at 9 o'clock," and return to find everything in perfect order, fresh flowers everywhere, the table set in holiday attire, and a course dinner perfectly planned?

We had such fun over our festive table settings. Aziza had once seen a table decorated for a party at the Rajah's, and he used the main motif, with variations of his own, whenever special occasion called. Intricate floral designs, with appropriate mottoes, were picked out in dyed rice, and tinsel leaves, cut out, I am sure, of the silver paper that came around the cigarettes, added a final glitter.

We had birthday mottoes, anniversary greetings, and good wishes; the lad searched his brain to carry out his pet scheme of decoration. He struck a fantastic zenith, however, one evening when we were having guests and I returned home with only time to dress and take a hurried look at the table. Before my own place, done in colored rice, sprawled a huge fish. Before Sahib's an unmistakable whisky bottle, trickling a small brown stream into a tiny glass. Real flowers graced the center of the table, but around them, in a circle, he had traced his ricy motto, "Well done!"

How banal I could become with my talk of household matters and of servants, but never was there such a household and never were such childlike servants!

WOMEN OF KASHMIR ARE NOTED FOR LOVELY EYES

Many of the Kashmiris are fine looking, the women especially having beautiful eyes and quite regular features. Like other native States of the Indian Empire, Kashmir has an English resident, or advisory official, and through him more sanitary ways of living are gradually being introduced into the country. There is an excellent mission hospital and a zenana hospital, as the name implies, for women, and a school conducted by an English clergyman is doing wonders among the youth of the country.*

The foreign element in Srinagar increases yearly. From the terrible heat of the Punjab come English Army people, seeking the cool air and health of the hills, and these bring with them the influence of English manners and customs, and, better still, of English fair play. There is not in all Srinagar a merchant who does not rely whole-heartedly on the honor of the English Sahib.

SHOPPING IN THE CITY OF THE SUN

Shopping is a quaint pastime in this City of the Sun. As one strolls along the Bund, eager merchants press their wares. Mohamad Jhan assures you that not in all Srinagar—no, not even at Ali Jhan's, his rival—can you procure such embroideries, such fine pashmina, such beautiful designs. Will not the Lady Sahib but see?

Or, as the small shikara of Habib Joo is rowed alongside your boat, deftly timed to find you at home, the turbaned "box wallah" eagerly spreads his wares. He is insistent that you see his treasures. "Only looking, Lady Sahib. Not buying, only looking." The foxy wallah well knows his goods are tempting. He is sure that some time you will buy.

The native industries of Kashmir, alas, have cheapened and some have almost died out entirely. No longer, for instance, can one procure the very finest shawls, such as made the name of Kashmir famed throughout the world. One can get good shawls, soft and fine, but the exquisite, old-time shawls are hardly to be found outside of museums.

Pashmina is one of the loveliest products of the land. It is a soft cream-colored woolen cloth, made from the fine underhair of the Tibetan goat. The finer weaves are incredibly soft and the shawlmaker, hopeful for your order, will show you how a length of it can be drawn through a finger ring (see page 440).

A much heavier woolen cloth, something akin to Scottish homespun, is called puttoo, and the better weaves make splendid outing clothes.

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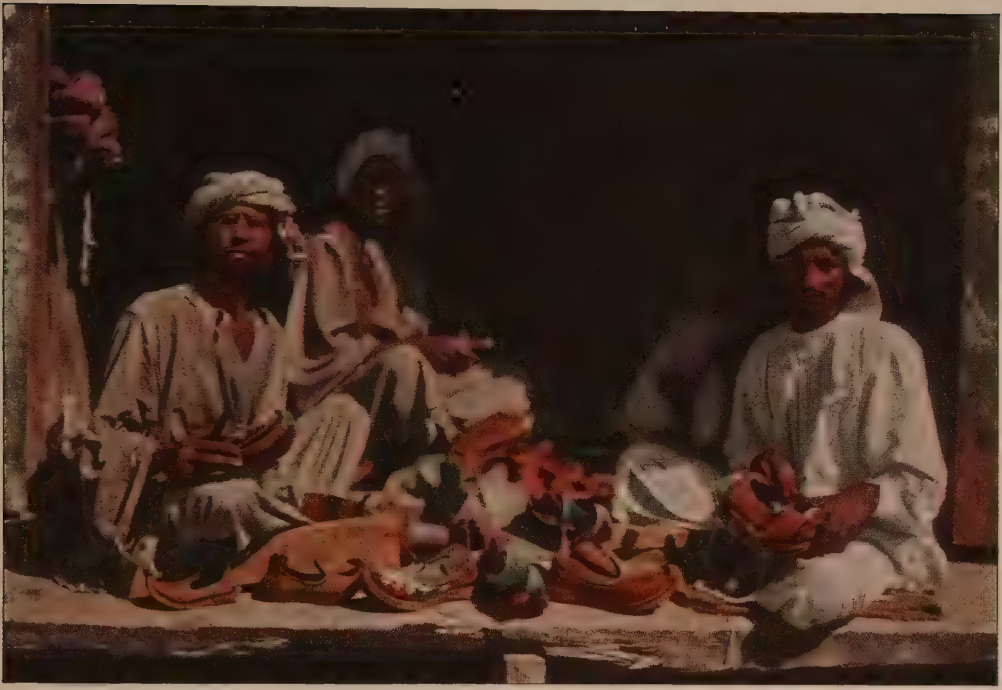
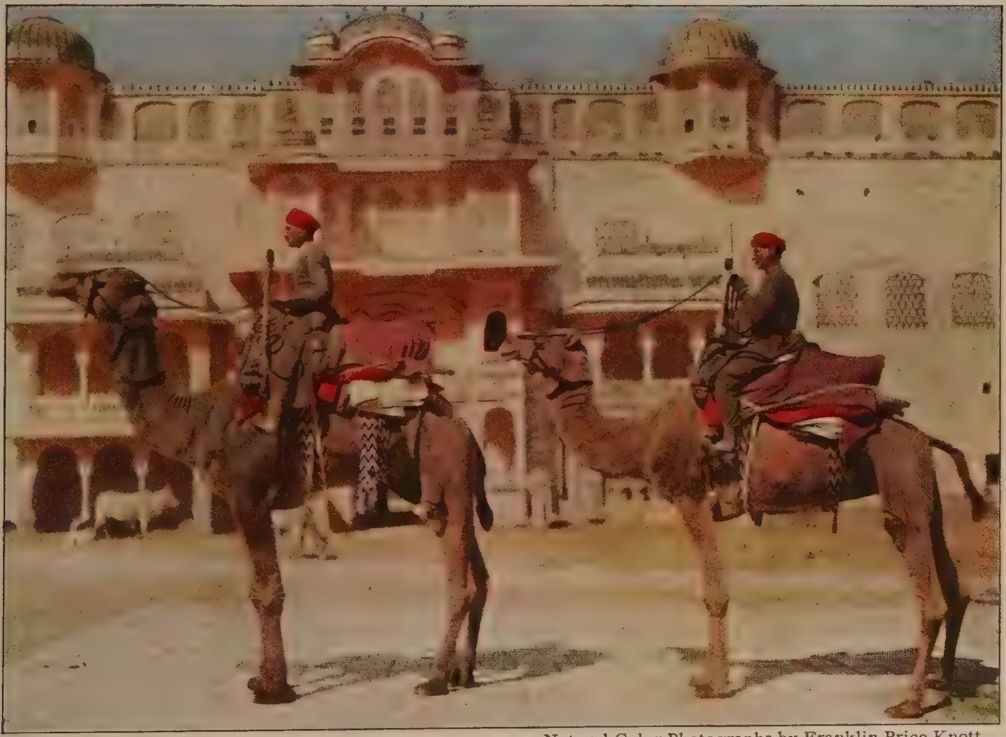
* See "Outwitting the Water Demons of Kashmir," by Maurice Pratt Dunlap, in the NATIONAL GEOGRAPHIC MAGAZINE for November, 1921.



AT DARYA KHAN EACH SHOEMAKER STICKS TO HIS LAST

Footgear with turned-up toes, hobnailed soles, and occasionally fancy tops are popular in this town of the western Punjab. The chief cobbler affects nose glasses.



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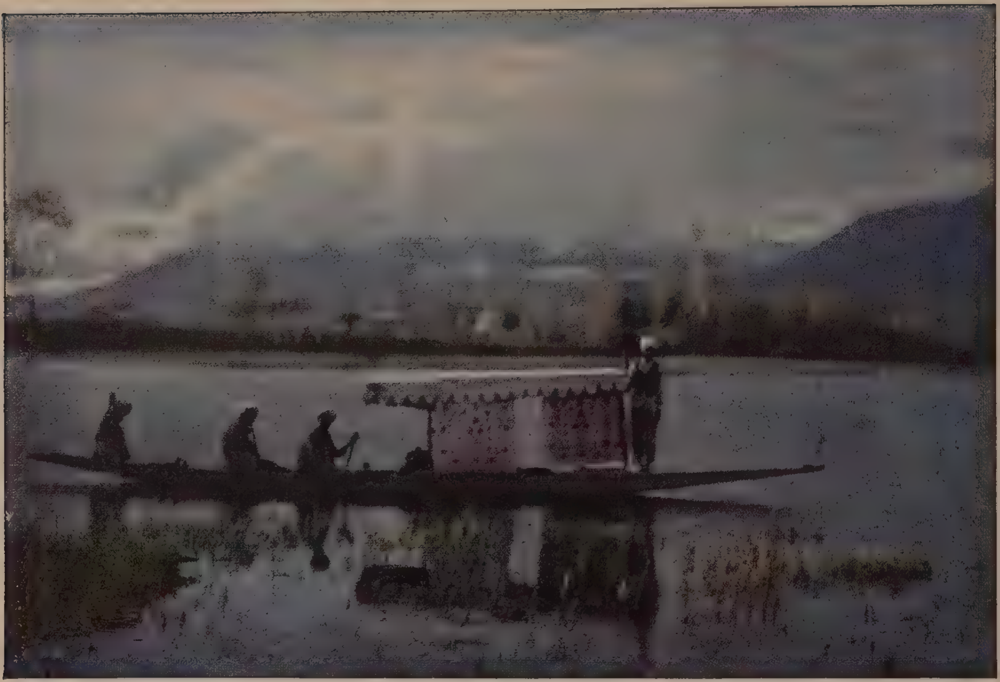
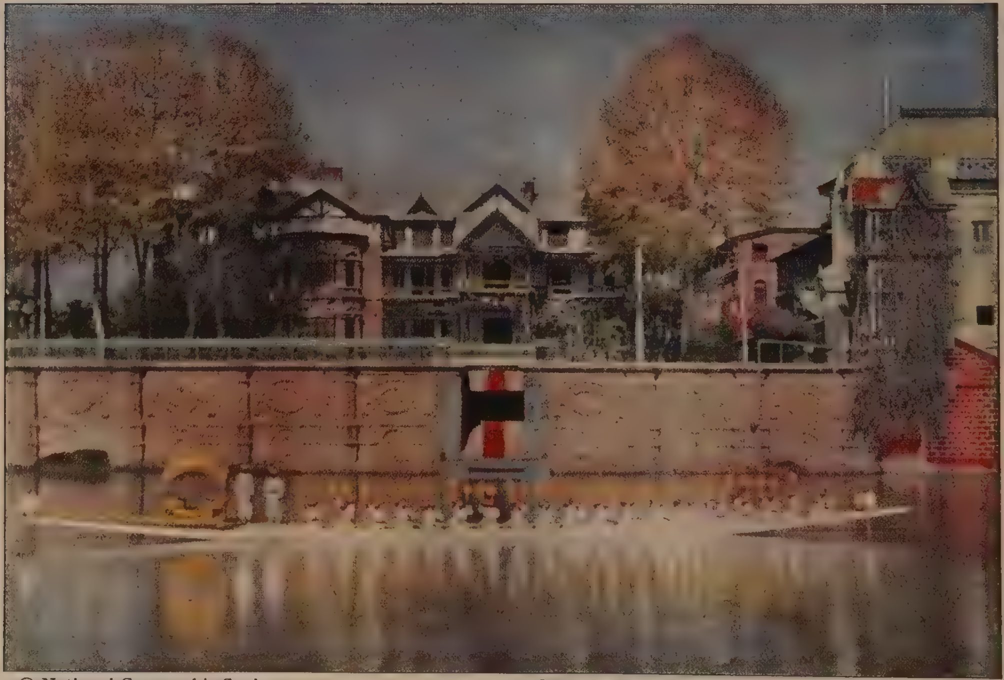
FROM THE ROYAL STABLES OF JAIPUR

Except for their grumbling, these carefully groomed animals are a far cry from "the commissariat camel and 'is commissariat load" immortalized in "Oonts," Kipling's ballad of the Northern India Transport Train.



DAL LAKE, NEAR SRINAGAR, MIRRORS NATURE'S GIFTS TO KASHMIR

"Place of delight" for the tired man, and "solitary sojourn" for the recluse—so Akbar's historian describes this entrancing sheet of water. The boat is a *shikara*, the gondola of the East.



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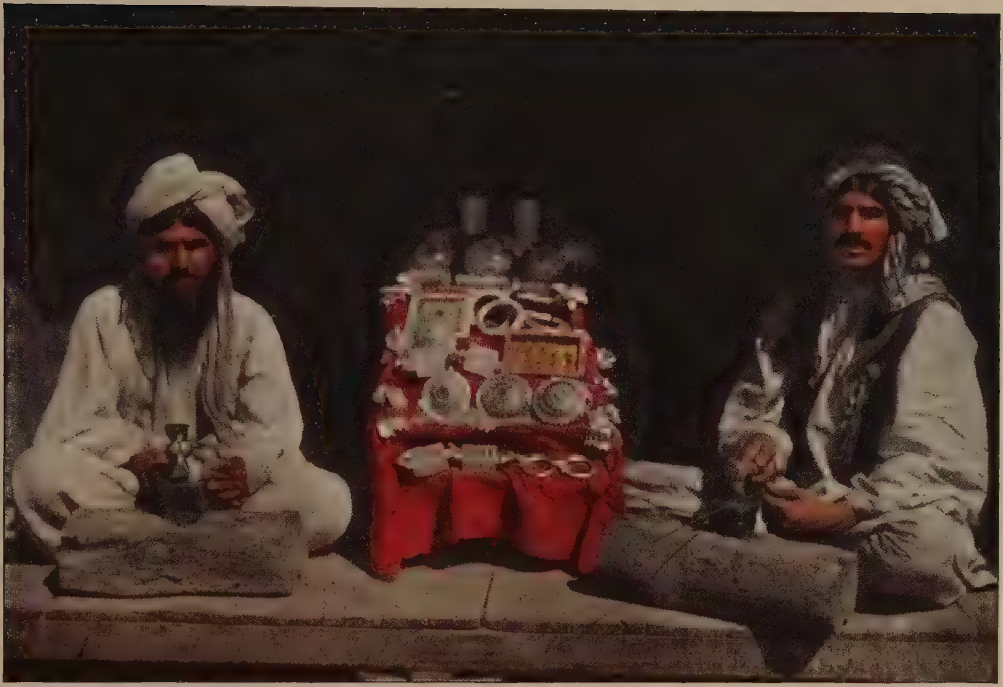
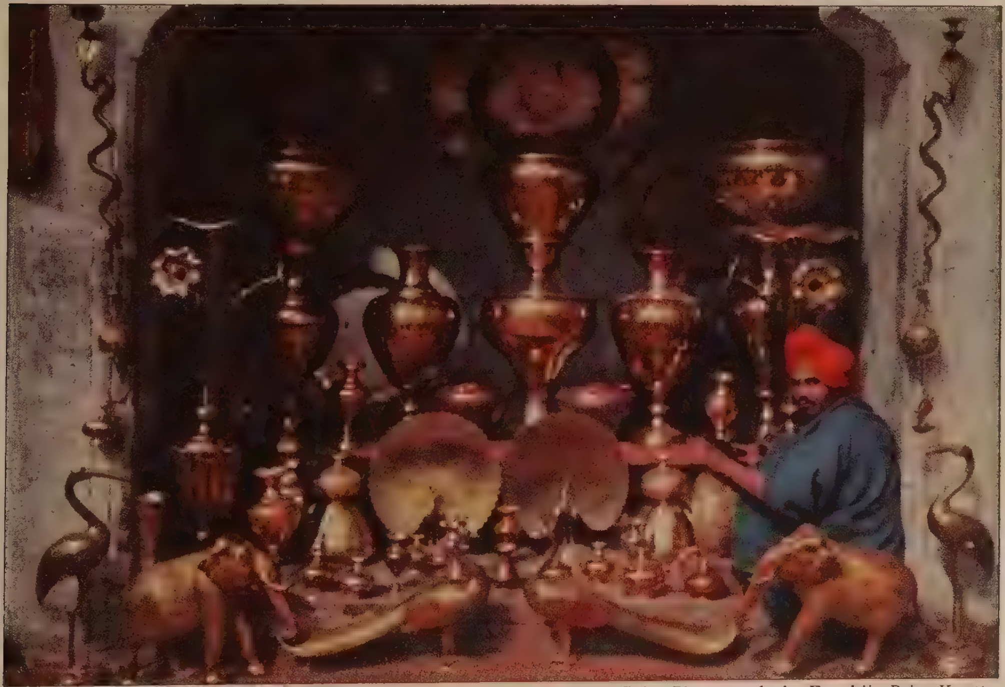
THIS CRAFT OF STATE MOVES TO THE MUSIC OF HEART-SHAPED PADDLES

Every spring the Maharaja of Jammu and Kashmir comes to his summer palace at Srinagar, and the Jhelum River scintillates with color and crowds. The British representative and his staff, and native State officials, go down the river below the city to meet him.



JEWELERS OF DARYA KHAN REVEAL SECRETS OF THEIR CRAFT

This is a fairly large Punjab village (see also Color Plates IX and XII), and, being near forbidden Afghanistan, is one of the best places in India to see Afghan types.



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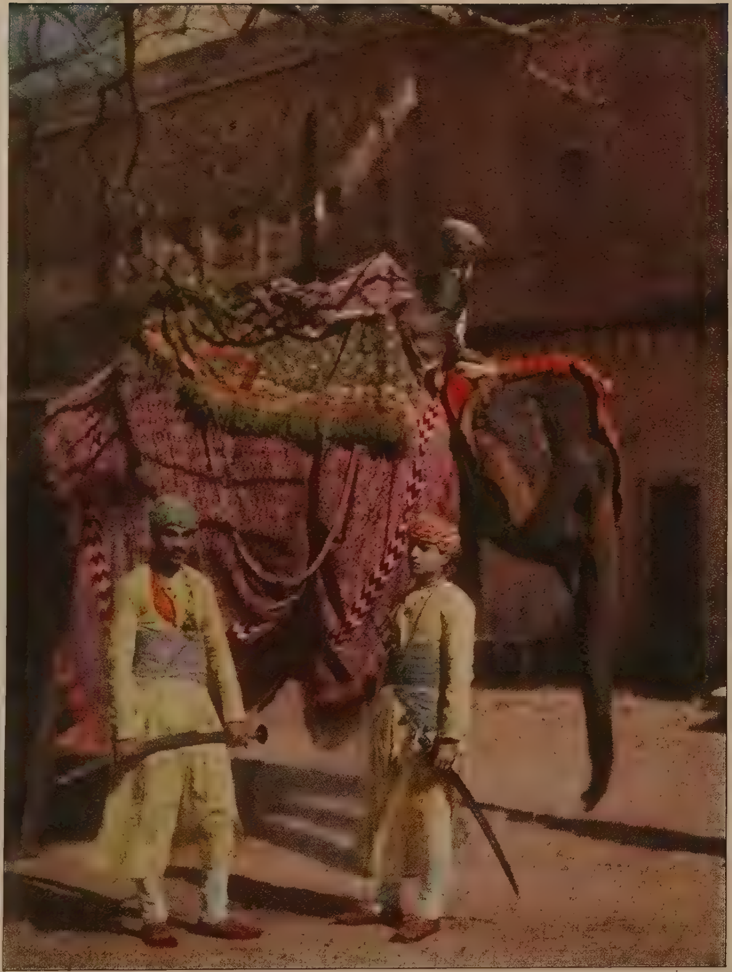
A JAIPUR BRASS-SMITH SHOWS THE VERSATILITY OF HIS ART

Evening is the best time to study the street life of this pink stuccoed capital. After the heat of the day is past, merchants open their booths along the main street and spread their wares—brass, shoes, textiles, or what not—on the pavement.



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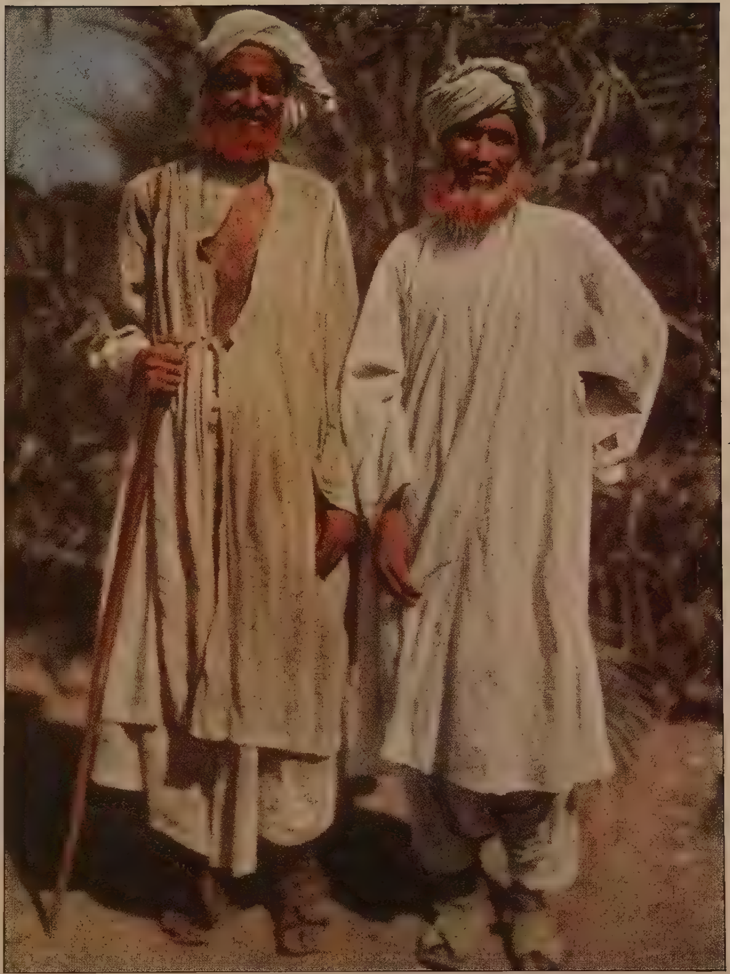
"MOVIES" INVADE JAIPUR'S ANCIENT CAPITAL

The men are screen actors who took part in a picture filmed at ruined Amber, once a magnificent city before a rajah moved the capital down to the plains. The elephant's usual task is to convey travelers from Amber city in the valley up a steep hill to the palace.



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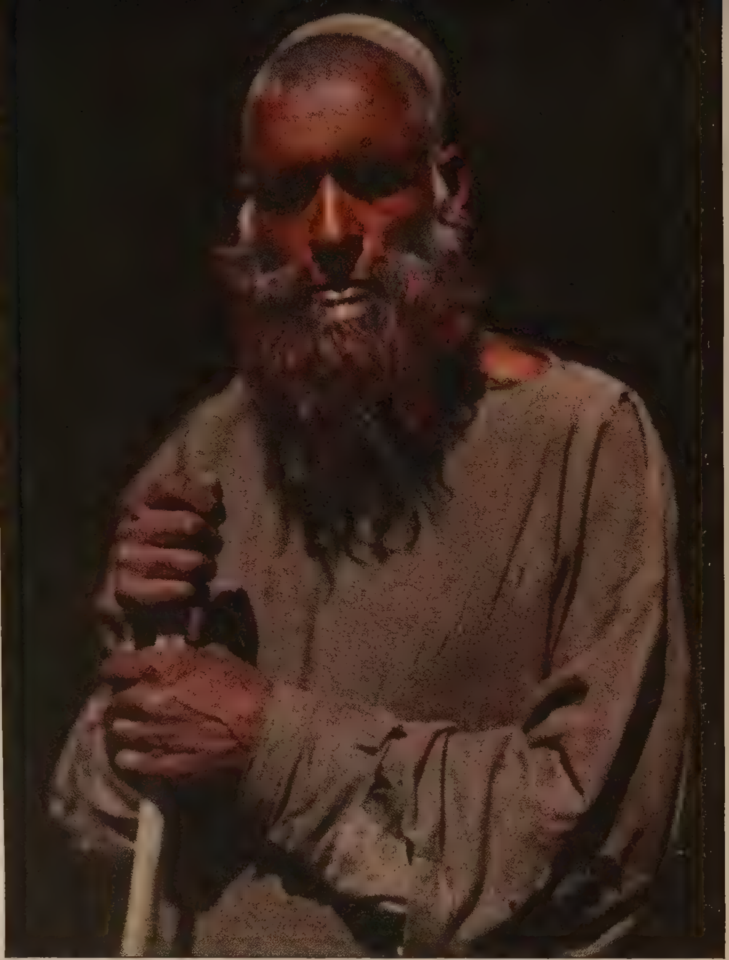
HENNAED BEARDS PROCLAIM THEM MECCA PILGRIMS

But when the photographer saw so many dyed whiskers that could not have afforded the expense of such a long journey, and a white pony with his tail hennaed, he doubted some of these pious claims. Taken at a fair in Darya Khan.



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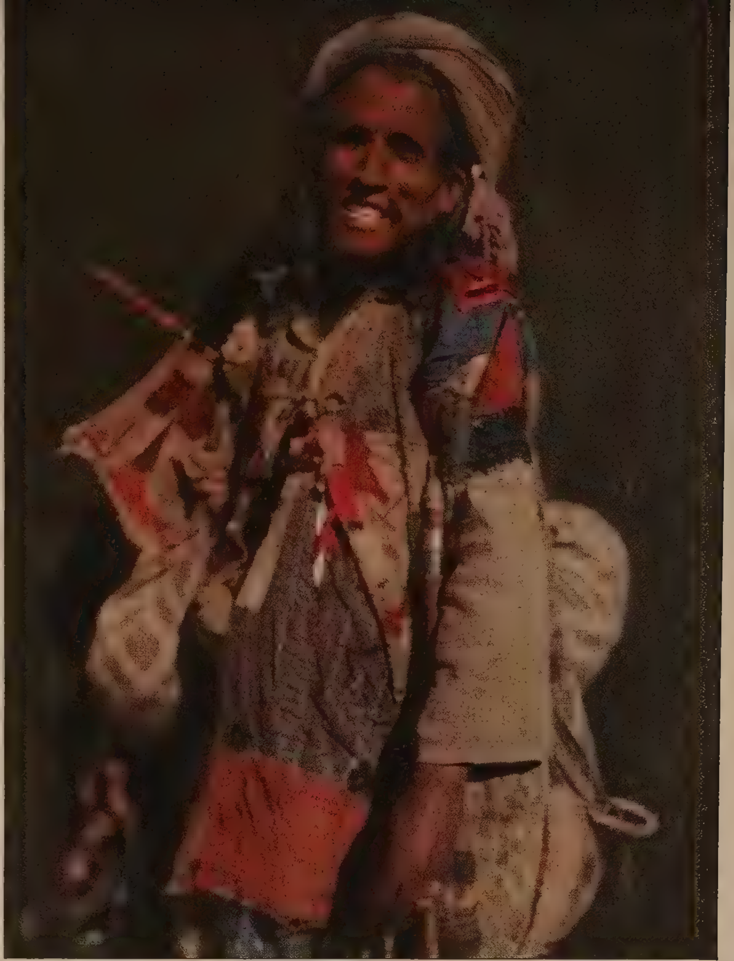
THE FINEST SUBJECT IN THE "WHISKERED" COUNTRY

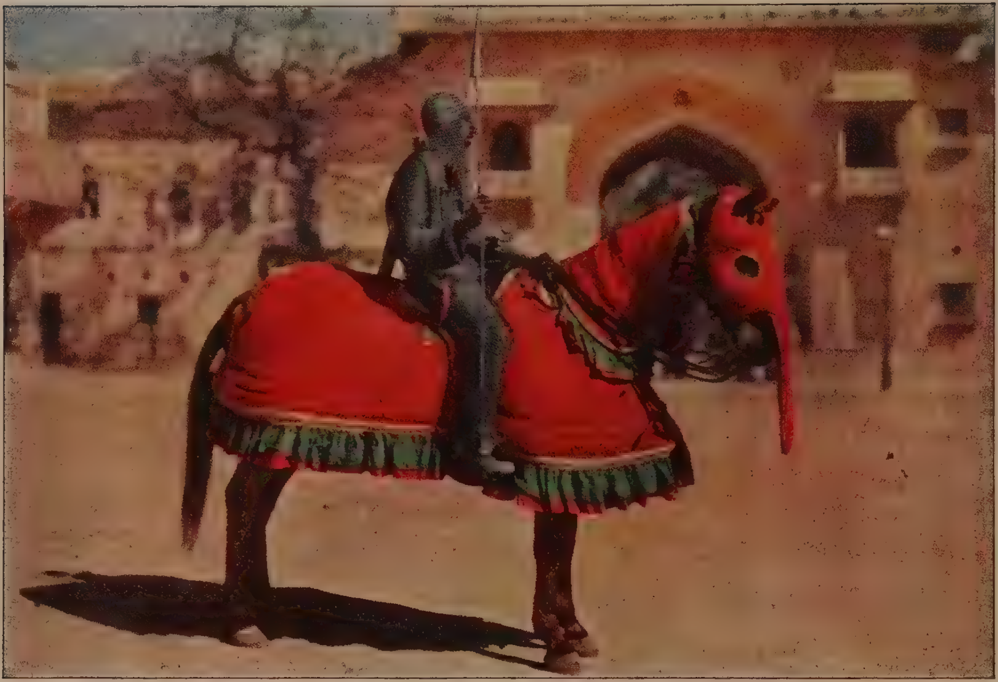
The Afridi, a gaunt-faced, athletic highlander (see also Color Plates VI and VII), has an evil name for ferocity and treachery, but those who know him say that when his inbred distrust of all mankind is overcome, he is kindly and devoted.



Natural-Color Photographs by Franklin Price Knott

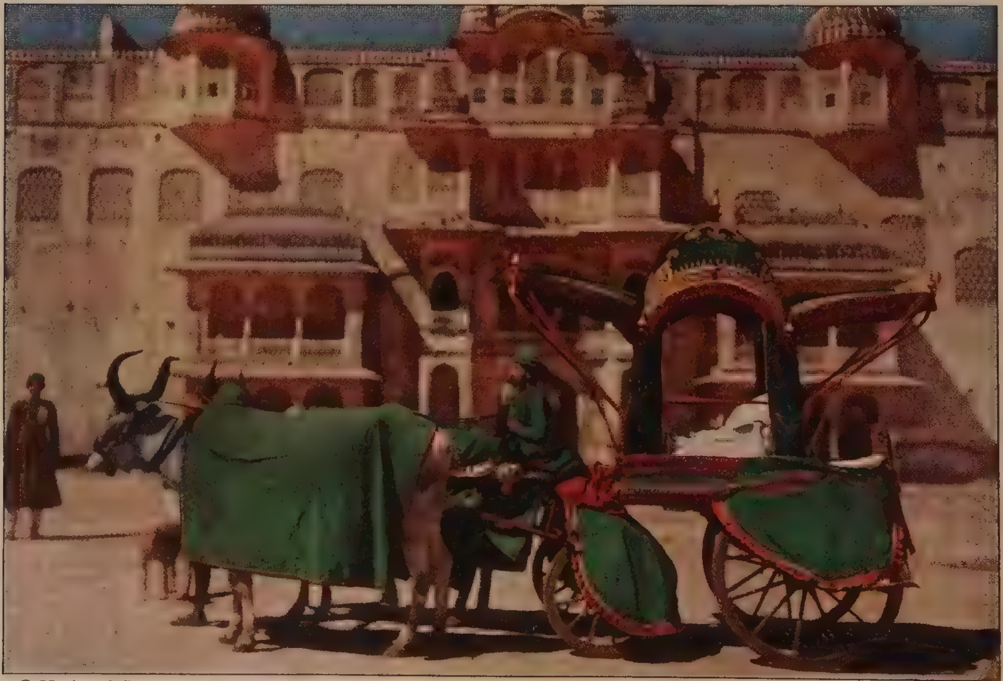
THOUGH CLAD IN RAGS, HE SMILES AT LIFE

Beggary is an art throughout the East, most of its devotees being professionals. They exist in such large numbers because many oriental people think that alms-giving is meritorious. This beggar plies his trade at Dera Ismail Khan, in the North West Frontier Province.



HIS SOLDIER FORBEARS DRESSED LIKE THIS IN MEDIEVAL DAYS

Helmed with steel, chain mail incasing his body, and thick, padded coverings protecting his steed, the warrior is ready for a tournament at Jaipur.



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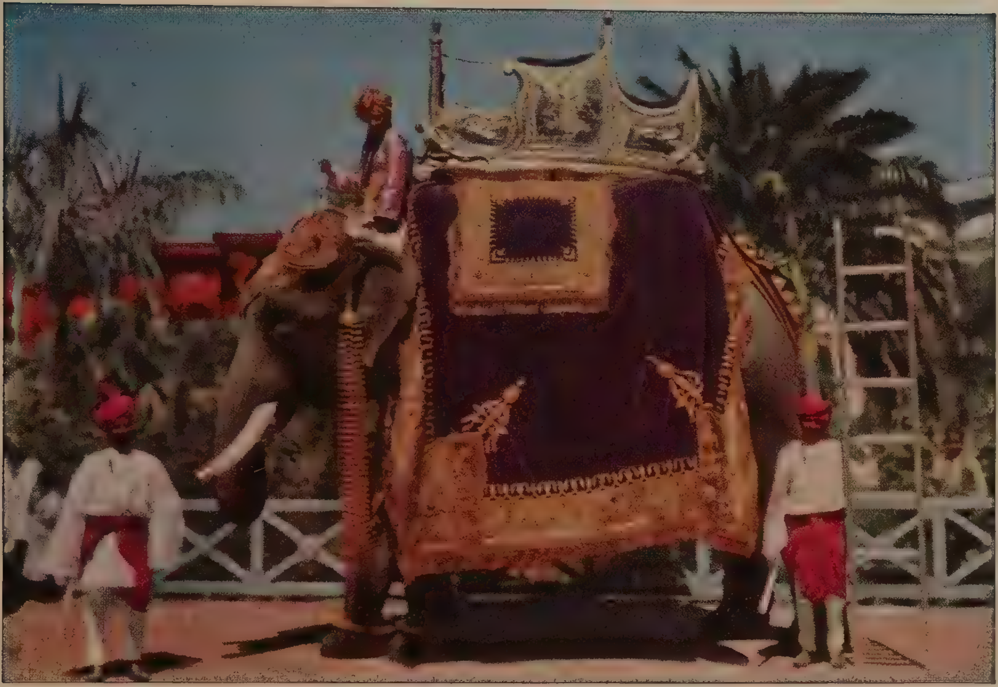
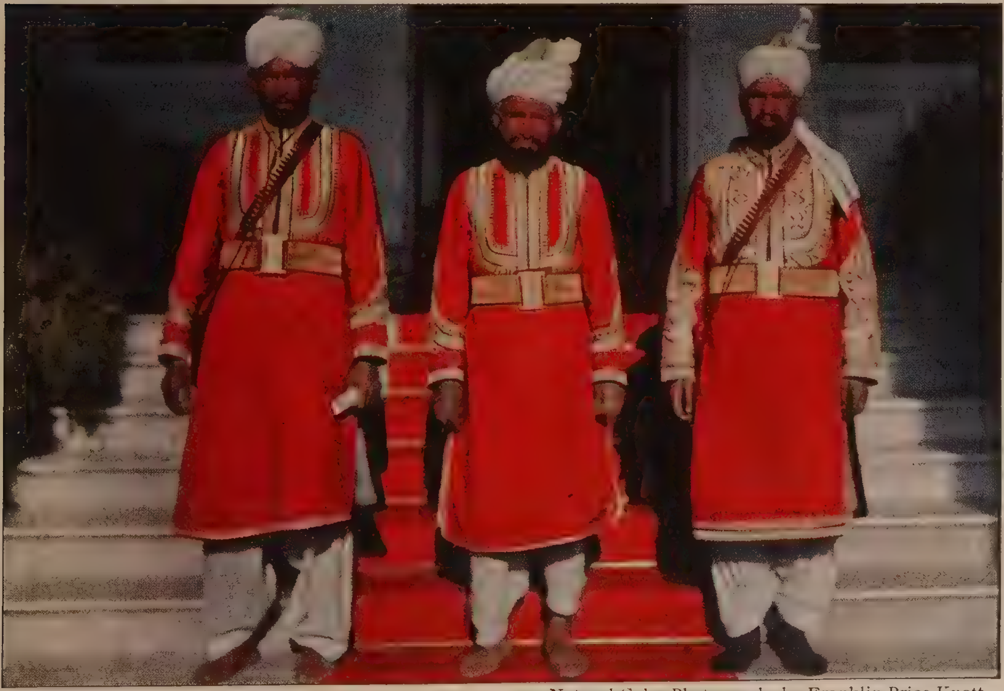
VELVET MUD GUARDS, A BADGE OF REGAL OWNERSHIP

No one may use this bullock cart except on State occasions. It stands before the Maharaja's palace at Jaipur.



THE ROYAL ELEPHANT'S TOILET IS A LENGTHY AFFAIR

The great beast is scrubbed and manicured before he is bedecked and the glittering, cumbersome howdah is put in place.



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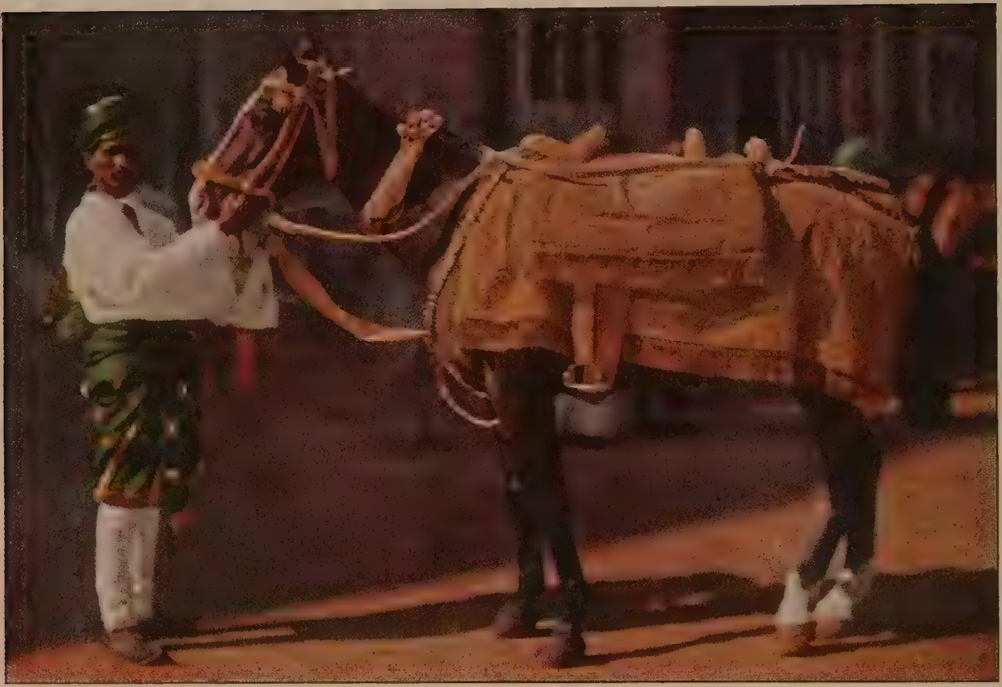
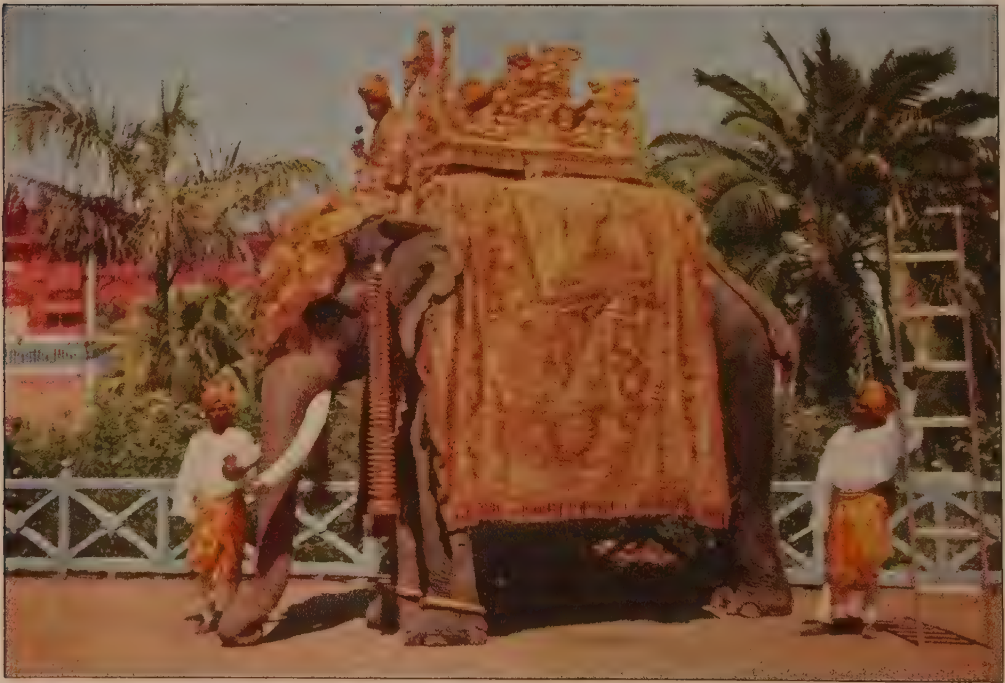
THEY GUARD THE COMMISSIONER'S PALACE AT PESHAWAR

The capital of the North West Frontier Province has been under British rule since 1849. It is eleven miles from the entrance to Khyber Pass.



HIS TRAPPINGS ARE WORTH $100,000

One of the many ponies owned by the Maharaja of Jammu and Kashmir.



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"THE POOR HAVE NO FRIENDS, BUT ELEPHANTS WAIT AT THE RICH MAN'S DOOR"

So runs an Indian proverb. A royal elephant of Jaipur wearing long gleaming earrings and anklets. The tusks have been squared off and bound in brass. The ladder aids in mounting to the howdah.

A few of the papier-mâché merchants have very good work for sale, and wood-carving is one of the arts of the valley; but it is difficult to get properly seasoned wood which will not warp. It is a pity, for the carving is a matter of endless labor and is often very lovely.

KASHMIR'S TWO INDUSTRIES—CARPET-WEAVING AND SILK-RAISING

Two large industries have been developed through the aid of English capital. These are carpet-weaving and silk-raising. Not much of the silk is woven into cloth in Kashmir, but the worms are bred and the cocoons worked into soft, yellow skeins, which are usually shipped to England to be turned into fabrics. Both of these factories use modern machinery and methods and employ a large number of native hands.

The small stalls in the native bazaars are generally amusing and full of local color. Squat, cross-legged figures sew or weave, or hammer at their metal wares. Idlers stand or sit about, puffing at a neighborly hubble-bubble.

Strident bargaining goes on at length. The Kashmiri is not quarrelsome with his fists, but he indulges in endless warfare with his tongue. Now and then the ghostlike figure of a Mohammedan purdah woman slips quietly through the crowd. She is swathed from head to foot in a voluminous *burka,* her face covering having only latticed openings through which she may dimly see but not be seen.

Children, half clothed or not at all, tumble and play underfoot, and pariah dogs sleep undisturbed in the sun. Now and then a tonga clangs its noisy way through the twisty streets or the raucous horn of an automobile is heard.

LIKE THE TAJ MAHAL, THE SHALIMAR GARDENS ARE A MEMORIAL

There are delightful excursions to be made around Srinagar. A favorite one, of course, is to Shalimar Gardens. Paddled by the three little boat boys, our shikara used to glide through the waters via the canal which connects the River Jhelum with Dal Lake.

Across this shadow-bordered lake, with its clear, cool water, and in about an hour, we were at the entrance to Shalimar, the lovely Persian Garden, laid out and made beautiful by the Mogul Emperor Jahangir for his beloved wife, Nur Mahal. It is a spot of perfect beauty.

Clear waters from the lofty mountains back of the garden have been trained to flow over a series of steps. Terraced lawns and flower beds of gorgeous colors delight the eye. Chenar trees cast a grateful shade where one may sit at ease watching the fountains play and the gaily dressed people who come on Sundays and on holidays.

A pavilion of black marble, brought all the way from Delhi, stands at the upper end of the garden, the water flowing both under and around it. In imagination one can picture this garden in the time of the lovely Nur Mahal, people it with dancing girls and slaves, and fancy one hears the quaint music of another day. It must have been a scene of exotic loveliness. There are other formal gardens around Srinagar—Nishat Bagh, Nasim Bagh—but to me Shalimar is the wonder of them all (see illustration, page 439).

GARDENS BUILT ON RAFTS

I had heard of the floating gardens in Dal Lake and was anxious to see them. It seems that, in a country where many of the people are too poor to own land, the peasant has hit upon a clever scheme. With long-handled tongs he drags mud from the bottom of the lake. This he mixes with twigs to hold it together and dries in lumps, possibly a foot in diameter. When he has accumulated enough of these, he binds them together with many reeds and makes of them a sort of raft. Into each round mass of dried mud he puts his seeds, and so raises such vegetables as he may need (see page 447).

Melons, cucumbers, tomatoes, and the small, purplish *brinjal,* which is a dwarf edition of our eggplant, all grow luxuriantly in these novel garden plots, drawing their moisture from the waters on which they float.

A friend of mine told of finding one morning after a storm a large expanse of bobbing land outside her house-boat windows. As she looked her amazement, an excited and very voluble Kashmiri

A LONG DAY'S LABOR FOR A BOATLOAD OF WOOD

Yet the old man feels well repaid. Wood is the sole fuel of Kashmir, and each house boat is limited to so many maunds a month, a maund being 82-2/7 pounds.

SORTING COCOONS IN THE STATE SILK FACTORY AT SRINAGAR

The work is usually done by women and young girls (see, also, Color Plate VIII and illustrations, pages 448 and 449).

MANY ROADS THROUGH THE VALE OF KASHMIR ARE LINED WITH POPLARS

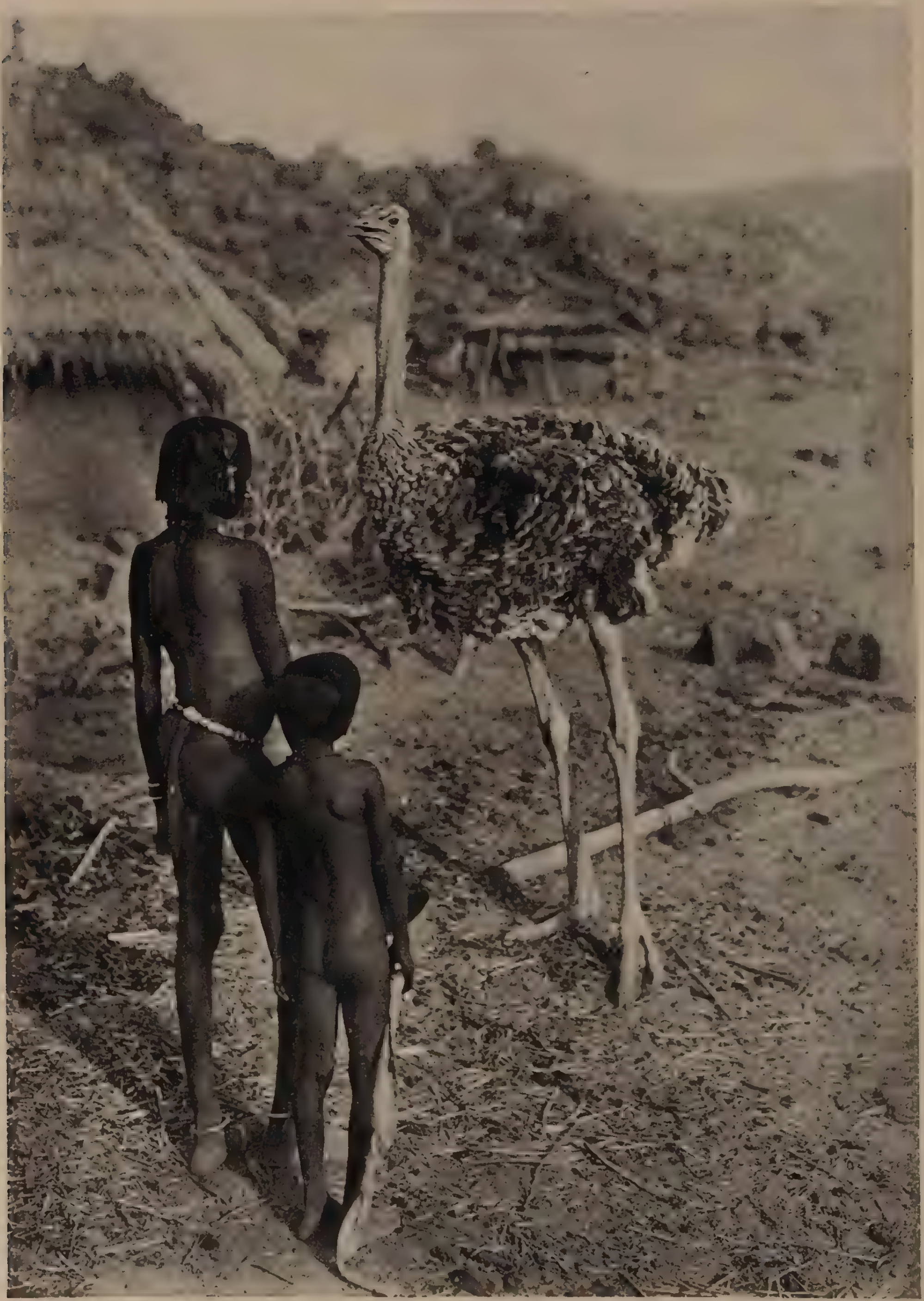
Part of a 35-mile stretch from Baramula to Srinagar, which has scarcely a break in its shady border. Baramula is not only Kashmir's river port, but the gateway to the Vale.

appeared in a dugout and, attaching a rope to some roots, paddled furiously away, his rescued truck garden trailing along behind him.

Dal Lake is always beautiful, but in August, when the lotus is in bloom, it is probably at its best. The green pads of this sacred flower of the Hindus and Buddhists cover large areas, and the blossoms, delicately pink, rise above the leaves, swaying as the waters rise and fall. The Maharaja sends his servants with great baskets daily and has large numbers cut for his own personal use.

It is hard to write adequately of the Vale of Kashmir. Snow-capped mountains stand reflected in the cool, clear lakes. Chenar trees, poplars, and silver spruce spread their shade above the greenest sward. Fragrant flowers of many hues are everywhere. There is such a wealth of Nature's gifts that one can well understand how it has come to be called "The Happy Valley."

* * *



A PET OSTRICH HAS THE RUN OF A NUBA VILLAGE

The Nubas, living to the south of Abu Zabad, are one of the wildest tribes of the Sudan. For many years they were in constant dread of raids from the powerful and warlike Messeria, whose practice it was to kill all men who resisted and to carry off the others as slaves (see text, page 467).

TWO FIGHTING TRIBES OF THE SUDAN

By Merian C. Cooper; Photographs by
Ernest B. Schoedsack

Co-authors of "The Warfare of the Jungle Folk," in the National Geographic Magazine

IT IS not so long ago—indeed, President Hoover had already reached manhood and had become a mining engineer and ex-President Coolidge was an active young lawyer—since a great section of North Africa, the Sudan, was cut off from all civilized mankind. To the Western World, what was taking place within the wide borders of this land was almost unknown. All that men knew was that somewhere in the heart of these vast sweeps of desert ruled the Mahdi's successor, a savage, fanatical warrior leader called the Khalifa, who had declared war against all the enemies of his faith.

And behind the Khalifa to battle rode the great fighting tribes of the Sudan, men almost unequaled in modern history for sheer brute fighting courage; almost unequaled for savagery also; for they made a shambles of the Sudan. In the seventeen years from 1882 to 1899 more than six million people are said to have been the victims of the dervish rule.

War, famine, disease, and more war. Life was cheap; death or mutilation was the punishment for those who even whispered disobedience to the rule of the Khalifa. He lived only for power—power absolute, the power of conquest.

"Kill! Kill!" was the order he gave to his emirs, until from the borders of the Red Sea to the great western deserts and from northern Egypt to the jungles of the upper Nile, 1,500 miles south, there raged such a storm of savage military might as even Africa had rarely known.

ALL WHITE MEN WERE SLAVES OR PRISONERS

In all this vast dervish empire were only a half dozen or so white men, and these men were slaves and prisoners. All that the civilized world knew of their existence was that occasionally across the mysterious borders of the Sudan there escaped some black man bearing, at the risk of his life, a tortured plea for aid. And the nations of Europe were powerless to help these miserable prisoners, for rather than permit a "Christian dog" to enter the domain of the Khalifa a hundred thousand warriors stood ready to die.

AN AMAZING CHANGE TAKES PLACE IN 30 YEARS

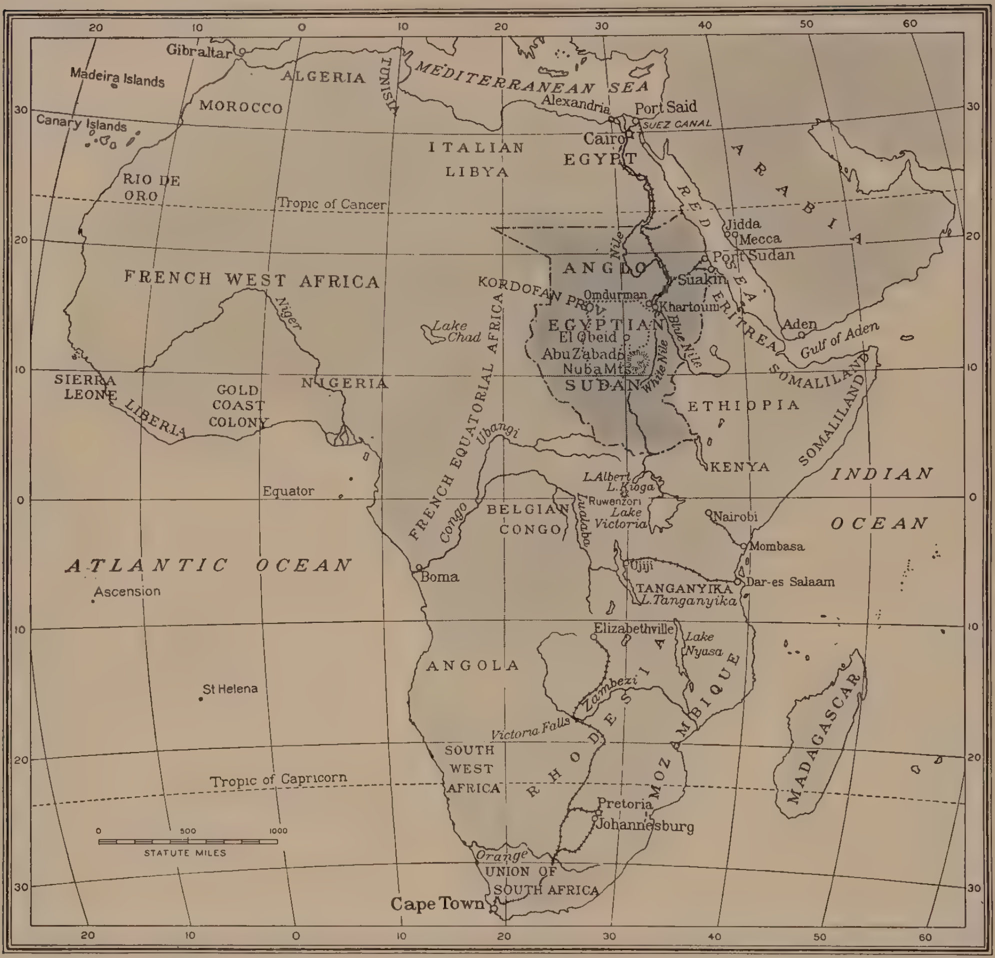
That was just a little more than thirty years ago. . . .

Yet one night, not many months ago, I sat beside a candle-lighted table, under the stars, in the open courtyard of a thatched-roofed, single-story house of a little African village. Across from me, by the dim candlelight, I could just make out the white face of a young man in his late twenties. The place was Abu Zabad, some 300 miles, as the crow flies, from the Sudan capital, Khartoum, where Gordon died on dervish spears, and more than 100 miles from the nearest whites, at El Obeid. The young man was Mr. Blackley, a Britisher, who, although he lived there alone, with only a handful of native police, was, under the title of Assistant District Commissioner, the real ruler of a huge slice of that savage, all-conquering, defiant dervish empire of thirty years ago.

This night there were present two other white men, rare visitors in this lonely spot: a young Scotch captain of the native Camel Corps, out on a 500-mile trek with his men, and a doctor. As I sat and listened to them, it was hard to realize that the millions of wild men who inhabit this great, savage Sudan are ruled to-day by a few score of just such young Englishmen as these who joked with each other so casually; and that these young Englishmen, somehow, though they lived alone and practically unprotected, were absolute masters and governors of all.

How do they manage it?

I thought: First came Kitchener's great march—the complete defeat of the dervish army near Omdurman. Then, after this, came the British administrators. Courage, unshaken belief in their race and their caste, and rigid, absolute, unswerving, impeccable justice have given to these administrators this mastery over the war-


Gibraltar
Madeira Islands
ALGERIA
TUNISIA
MEDITERRANEAN SEA
Alexandria
Port Said
SUEZ CANAL
MOROCCO
Canary Islands
Cairo
ITALIAN LIBYA
EGYPT
ARABIA
RIO DE ORO
Tropic of Cancer
RED SEA
Jidda
Mecca
Port Sudan
Nile
ANGLO
Suakin
FRENCH WEST AFRICA
KORDOFAN PROV.
Omdurman
Khartoum
Niger
Lake Chad
FRENCH EQUATORIAL AFRICA
EGYPTIAN SUDAN
El Obeid
Abu Zabad
Nuba Mts
Blue Nile
White Nile
ERITREA
Aden
Gulf of Aden
SOMALILAND
SIERRA LEONE
GOLD COAST COLONY
NIGERIA
LIBERIA
ETHIOPIA
Ubangi
KENYA
INDIAN OCEAN
L. Albert
L. Kioga
Ruwenzori
Lake Victoria
Equator
BELGIAN CONGO
Lualaba
Congo
Nairobi
OCEAN
Mombasa
ATLANTIC OCEAN
Boma
Ujiji
Ascension
TANGANYIKA
L. Tanganyika
Dar-es Salaam
Elizabethville
Lake Nyasa
ANGOLA
MOZAMBIQUE
Zambezi
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Drawn by A. H. Bumstead

A SKETCH MAP OF AFRICA, SHOWING THE HOMES OF THE FIGHTING TRIBES OF THE SUDAN

The Messeria occupy the region to the south of Abu Zabad, in Kordofan; the Fuzzy-Wuzzies live among the hills along the Red Sea, west of Port Sudan and Suakin.

like and still fanatically religious tribes of the Sudan.

It is because of this prestige of the white race which the British administrators have established that we—Mr. and Mrs. Ernest B. Schoedsack and I—were able to live alone, without protection and without being in the slightest danger, among two of the most famous of the former fighting tribes.

A VISIT TO TWO FAMOUS HORSE AND CAMEL TRIBES

We first visited the Messeria, one of the nomad "horse tribes" of the western Sudan, and afterward the Amarar, one of the three "camel tribes" of the Red Sea Hills, immortalized by Kipling as the "Fuzzy-Wuzzies."

When we left El Obeid to go among the Messeria we thought of all western Kordofan as a sandy waste of desert. Indeed, in the Sudan they always speak of it as a desert. But the country between El Obeid and Abu Zabad, the tiny native village where the Assistant District Commissioner made his headquarters, was, to our surprise, covered with low forest and scrub.

Until very recently the route we took

was a long, long march by camel or on horseback, but now one can get through by motor car, and it was in this manner that we traveled.

Mr. Blackley was living in a thatch-roofed dwelling at Abu Zabad, but a small brick house had just been completed for his use, and this he lent to us. We set up our cots in the bare rooms, our cook pitched camp outside, and here we lived in great comfort while waiting for the chief of the Messeria to gather together his tribe at a place along the Nuba Mountains some 250 miles to the south.

It was pleasant in Abu Zabad. Blackley lent us horses, and in the early morning, before the heat of the day, we would ride down and watch the young Scotchman drilling his Camel Corps, then back, and in the evenings to dine by candlelight, under the stars, with the clever and witty Englishman, who had spent his day as Justice of the King's Mercy among these strange peoples.

THROUGH THIS GATEWAY AT EL OBEID SWARMED THE FOLLOWERS OF THE MAHDI

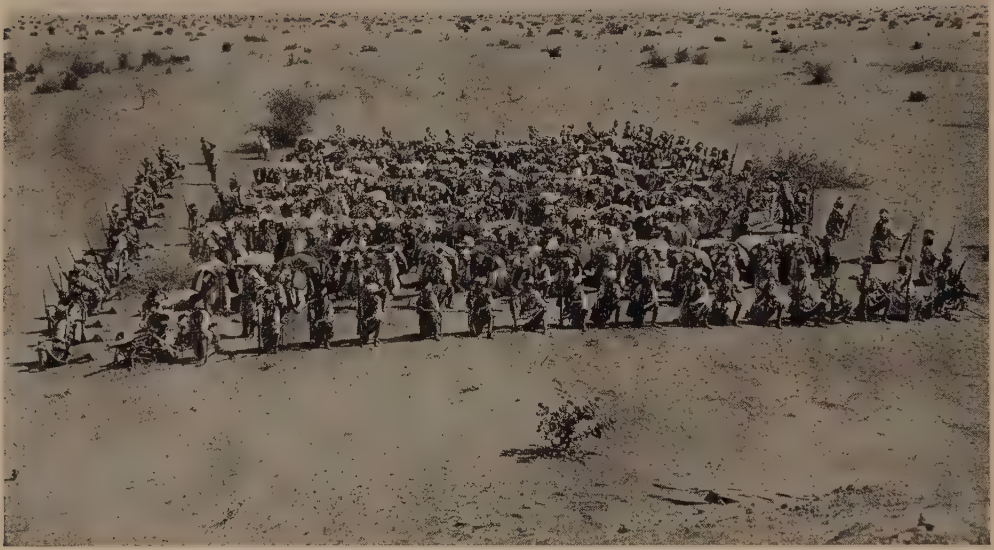
All that is left of the old wall which protected the town in the Dervish War. El Obeid is now the capital of Kordofan Province. A gum arabic market has made the town famous.

But word came that the tribe was gathering, and we were off. It took us two days of driving over a rough trail, through scrub country of the loneliest nature, almost uninhabited, before we finally pitched camp in a grove of large trees near the hills.

A NAZIR GIVES A SHOW

About a mile from us, through a deep gorge which leads to the foothills, and built up along the slope of one of the hills, was a Nuba village, its conical-roofed houses made of thatch and earth. Now, the Nubas are still one of the wildest tribes of the Sudan. They are distrustful of everybody and everything, as well they may be, because during many years the Messeria raided their villages, killing every man who made resistance and carrying off the others as slaves. They are to this day dirty, savage, and suspicious.

We liked our shady grove, and while Schoedsack and I prepared for picture work Mrs. Schoedsack took over the camp. She superintended our servants, installed an outdoor kitchen, and performed the manifold duties of camp life with the

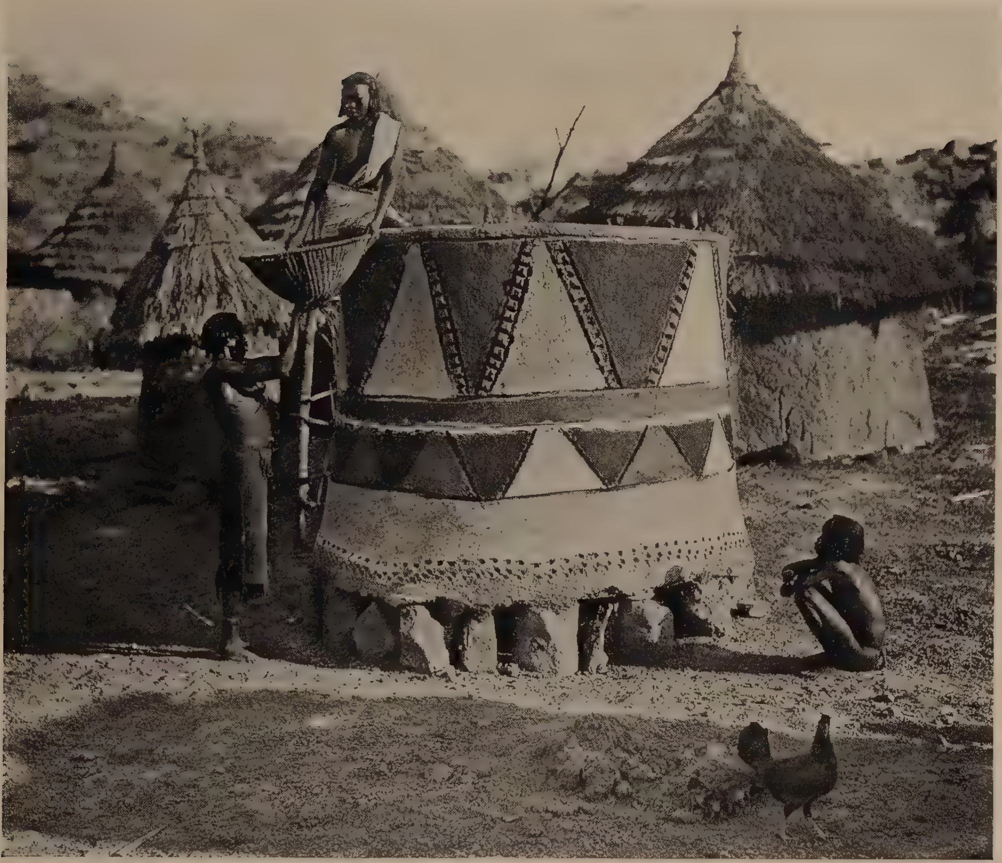


THEY KEEP THE PAX BRITANNICA IN KORDOFAN

A company of the Camel Corps formed in a square in battle position. Kordofan Province, now peacefully administered by a few lonely Britishers with the aid of native troops, was the scene of the Mahdi's rise to influence, for among the Baggara, to which tribe the Messeria belong, he found some of the most fanatical warriors of his force.

THE NUBA SMILE CAN BE INFECTIOUS, TOO

Woolly hair, thick lips, and dusky hues show how their race, though mixed in origin, remains essentially Negro.



NUBAS KEEP THEIR PRECIOUS GRAIN IN A CYLINDRICAL STOREHOUSE

They make various dishes from durra (millet) and maize, but vary the menu with live, honey-covered flies and locusts, slugs, snakes, monkeys, dogs, pheasants, and other animal and bird flesh. A hen and her brood of chicks in the foreground lend a homey note to the scene.

same excellence and capability which she displayed all during our year in Africa.

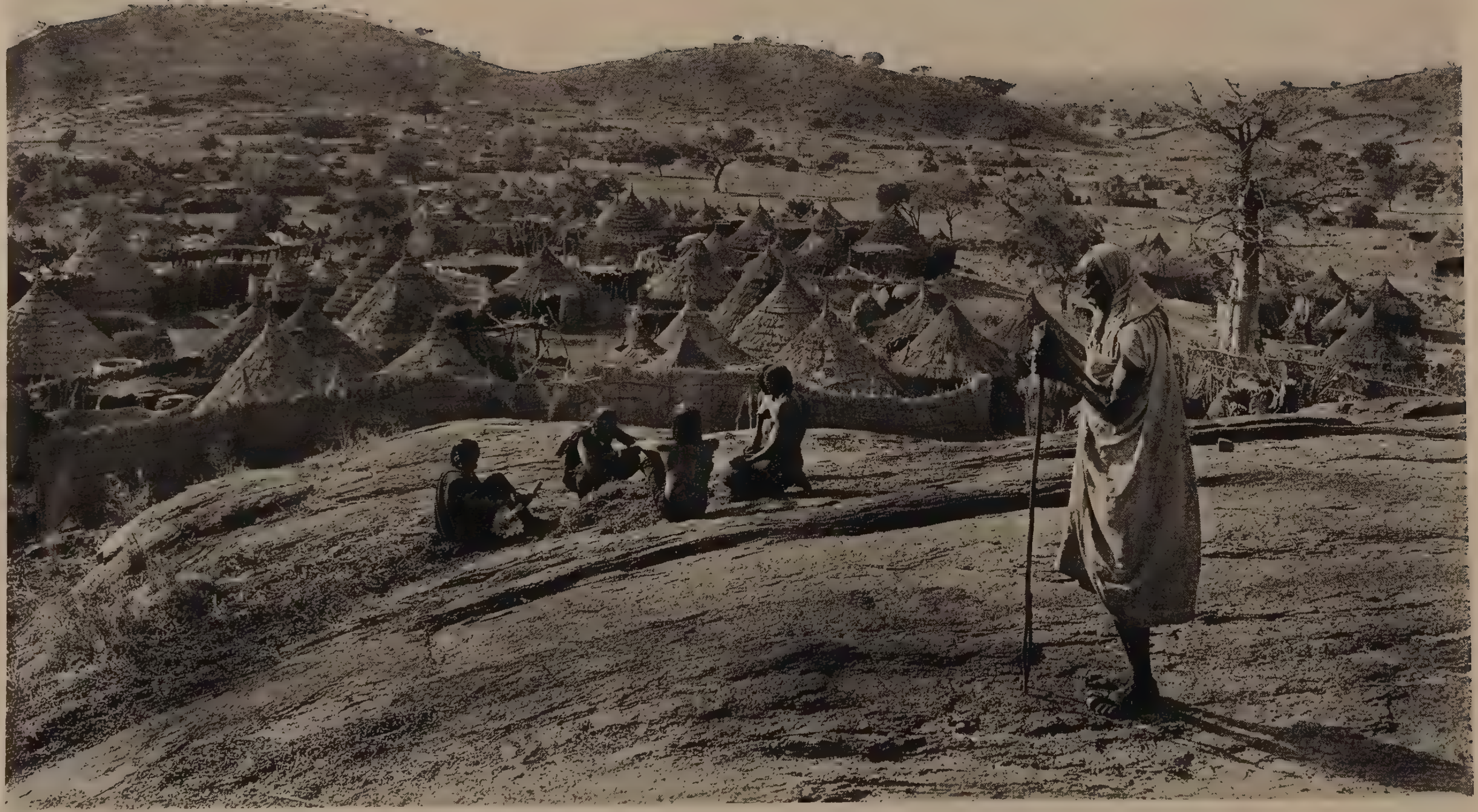
The second day in camp we were awakened by the sound of many voices. Turning out from our tents, we saw as strange and picturesque a cavalcade as one could hope to find in long traveling. Schoedsack and I have seen some nomad peoples on the march—the Uruks of southern Turkey, the Arabs of Mesopotamia, the Bakhtiari of Persia—but to my mind none of these could equal the Messeria for sheer picturesque color, though, of course, this day they had on all their special finery for our benefit (see page 471).

This column that we saw coming toward camp was the *ferik* of the Nazir himself. Black men and brown men in white robes and white turbans rode dashingly by on rough little ponies. They sat upright in their high-pommeled saddles, and their long-bladed spears and their bridles of chain flashed and glittered in the sunlight.

STRANGELY CAPARISONED CREATURES ADVANCE BETWEEN THE RIDERS

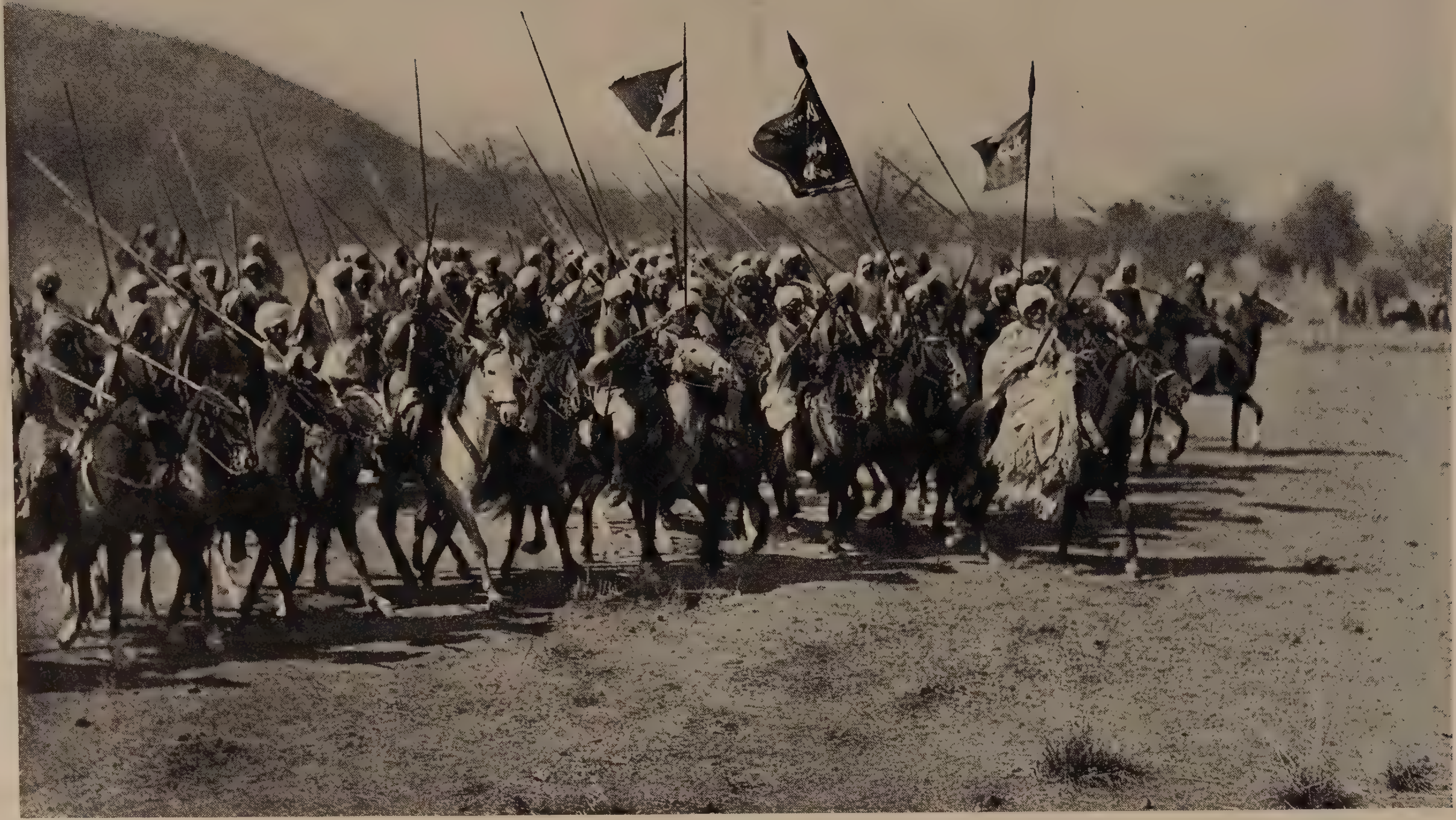
Between the riders, slowly and ponderously, there walked a long, single column of odd-looking objects. For a moment we could scarcely make out what these strange things were. Huge, monstrous shapes moving—that was all we could see.

But as they came closer we perceived that these curious objects were horned bulls, each animal almost hidden under an enormous saddle and a framework, which were covered with blankets of leather into which were woven innumerable small shells. On each one of these big frames



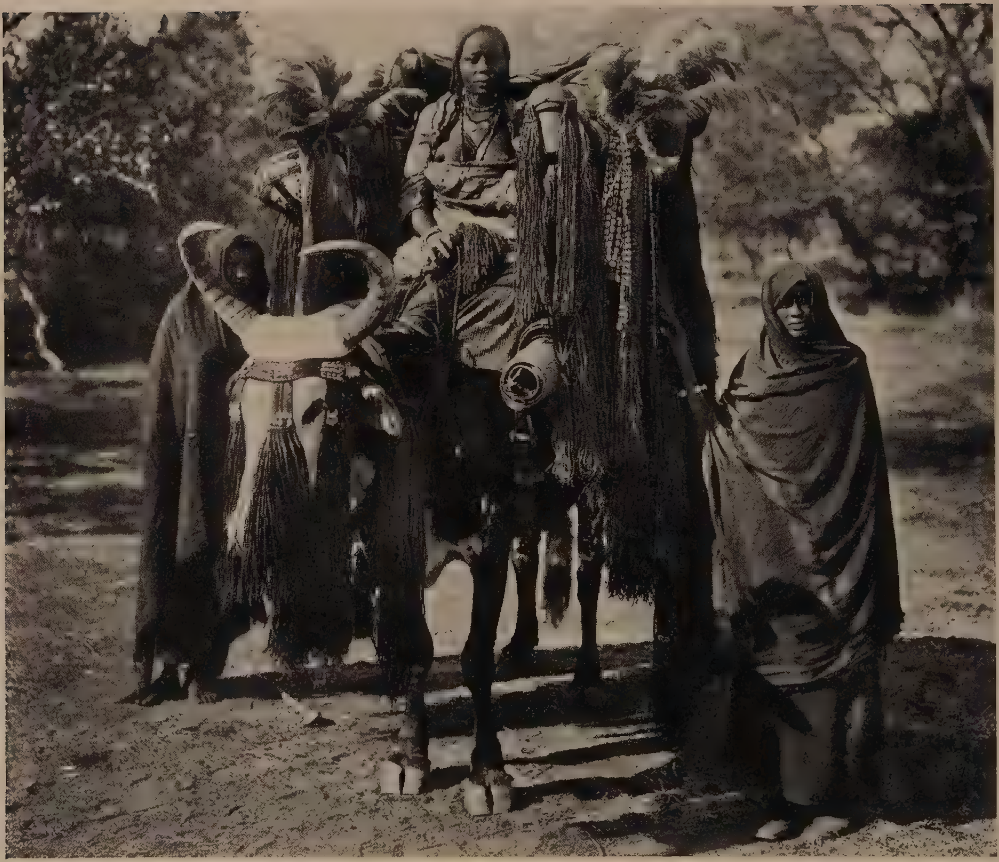
NUBA VILLAGES HUDDLE IN THE SHELTER OF THE HILLS

The huts, made of mud which has dried to concretelike hardness, are thatched with pointed roofs. The wives and children usually live in one house, the husband in another. Long ago, to escape Arab slave raids, the Nubas moved their homes from the plains to mountain strongholds.



FEW NOMAD PEOPLE SURPASS THE MESSERIA IN PICTURESQUENESS

Shouting black men and brown men in white robes and white turbans, their spears waving and their bridles of chain flashing in the sunlight, pass in review with their chieftain at their head (see text, page 469).



THE HOUSEHOLD EQUIPMENT OF THE NAZIR ON THE MOVE

With leather tassels flying and ostrich plumes waving, a bull moves ponderously under a huge framework piled with rugs, pots, pillows, and all the other personal and domestic luggage of the Messeria chief. Sitting on top is one of the women of his family, herself a barbaric vision of brilliantly colored dress and glittering ornaments of gold and silver. At the side walk two attendants, whose duty it is to balance the whole unwieldy burden.

were piled and hung rugs, pots, pillows, clothing—indeed, all the household equipment of a nomad native chieftain. On many, great bouquets of ostrich plumes jutted out at the front and on both sides of the enormous piles of luggage (see illustration above).

Some of the bulls had a kind of leather glove fastened on each of their horns, and beaded work and leather tassels hung from broad bands across their foreheads in such quantities as almost to blind the poor beasts. From every part of the contraption flapped long streamers made of dozens of fine cords of thin leather.

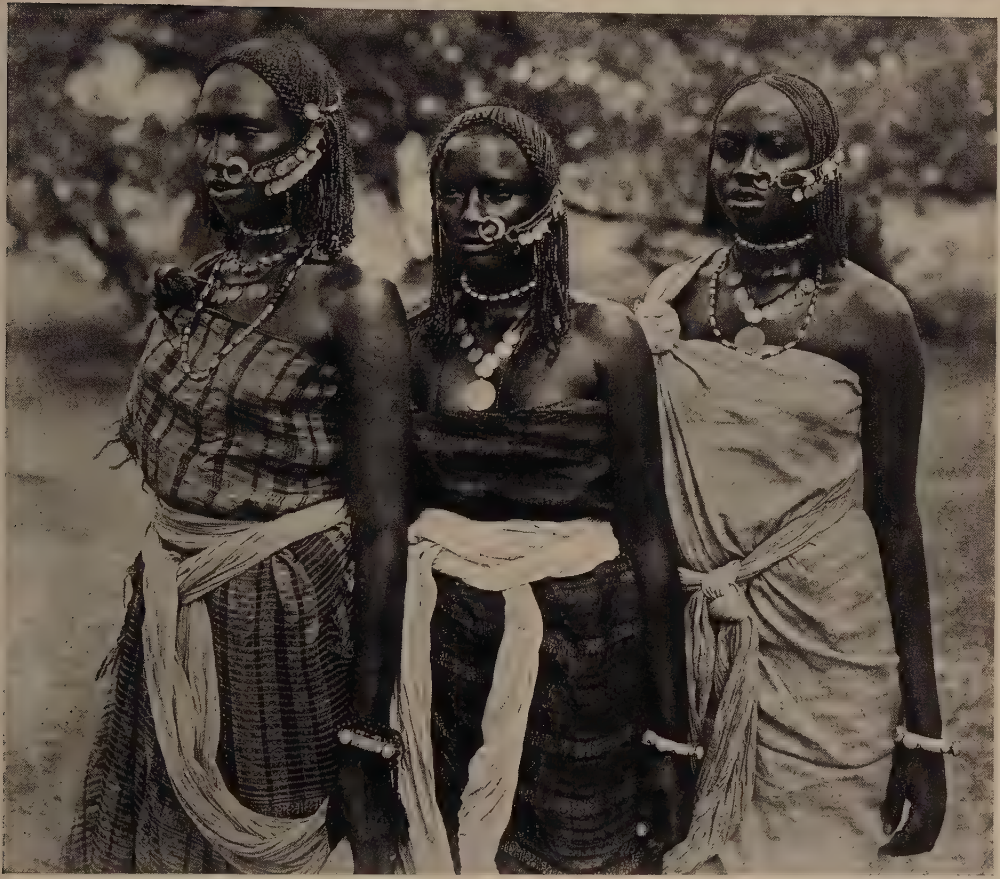
On top of each one of these weird-appearing beasts sat a woman, one of the wives, daughters, daughters-in-law, aunts, cousins, or what not of the Nazir.

And what women! Their robes, loose and graceful, were of brilliant colors. From every possible point dangled ornaments of silver and gold and strings of brilliantly colored beads—silver anklets, bracelets, necklaces, strings of golden coins, earrings; and frequently from nose to ear swung a heavy string of golden coins, while many of the women were crowned with what appeared to be spiked helmets of silver openwork (see p. 475).

To enable the poor bulls to proceed and to keep in place their unwieldy burdens, beside each animal there walked from two to four women attendants, constantly busy balancing the whole load.

The sound of the marching columns was barbaric.

The warriors dashed madly up and



IN THE NAZIR'S EYES, THESE GIRLS ARE BEAUTIFUL

In the camp of the Messeria chief are many handsome girls. Though he never has more than four or five wives at one time, he often changes; for, it was explained, "he likes plenty divorces, plenty new wives" (see text, page 477).

down the line, waving their spears and shouting, now and then sharply reining their horses to a full stop in front of us. Bells tinkled. An old man clad in white robes sat with great dignity on the back of a huge black bull and beat on a pair of drums in steady rhythm.

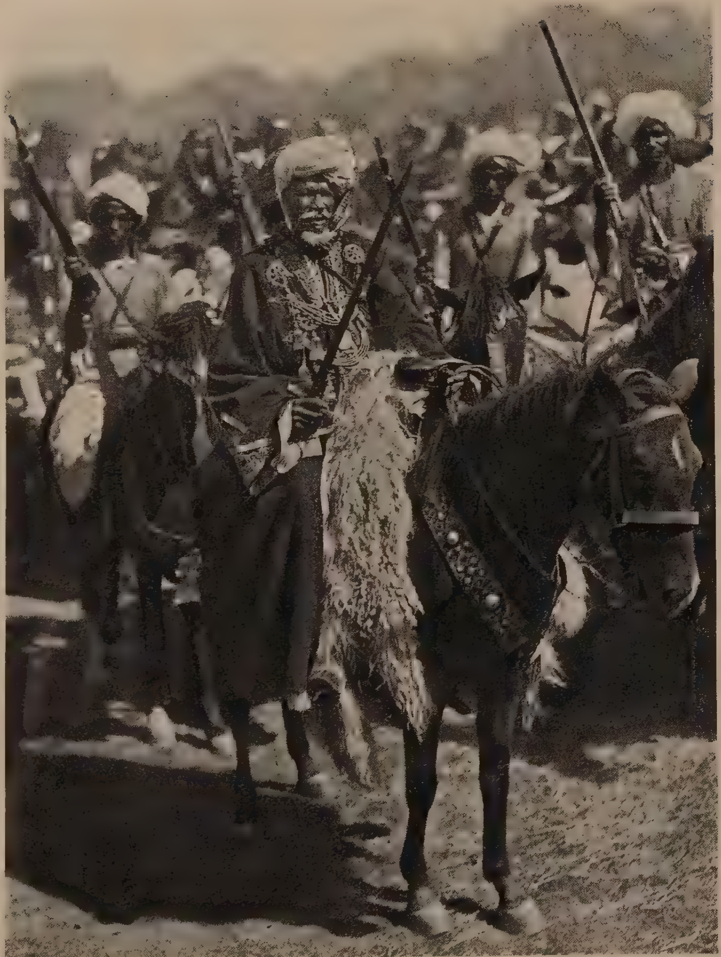
THE GENTLE-LOOKING CHIEF ONCE A FAMOUS WARRIOR

Then finally came the central figure of all, the Nazir, the chief, the ruler of the tribe. He made a gorgeous figure. A long, beautiful, white sheepskin covered his saddle, while the trappings of his horse were studded with shining metal.

A long blue robe of honor, embroidered in gold and silver, dropped to where it almost covered his feet. A great medal of silver hung among the golden crossbands which fastened his robes at his breast. A snowy white turban was held firmly on his head by a silken cloth of many colors bound about head and chin, and from one shoulder and projecting from under the armpit hung a long sword with a hilt of gold (see illustration, page 474).

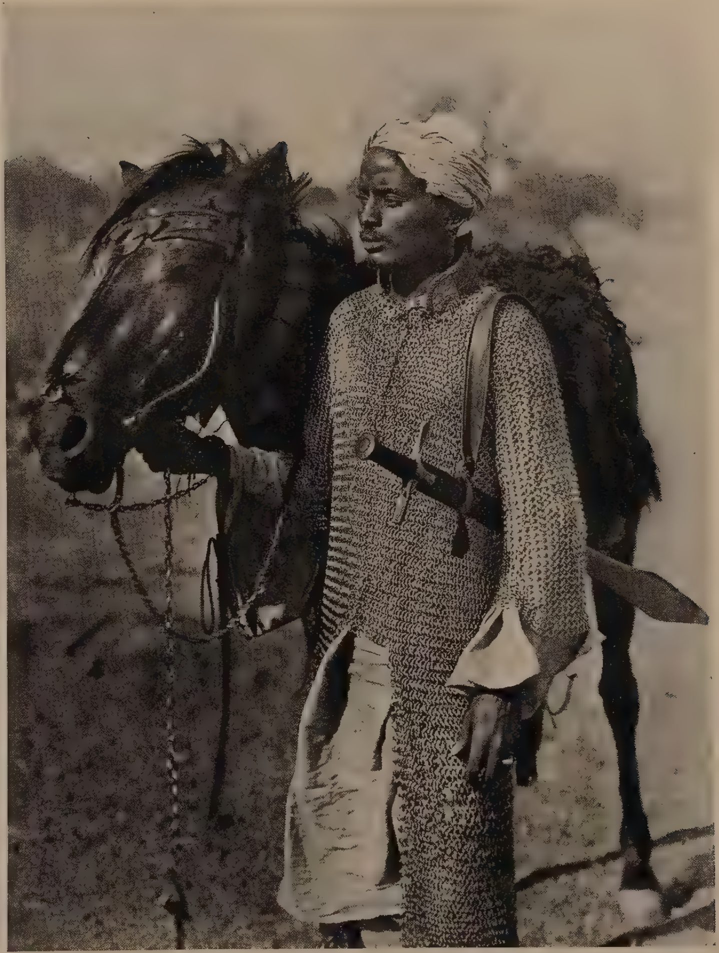
He rode with his chin up, did this old nomad chieftain, and his straight nose, aquiline features, white beard, and white mustache gave him an air of dignity and command.

About the Nazir galloped his bodyguard on dancing, spirited horses. They sat upright, despite the fact that from the shoulders of each and every man of them hung a heavy coat of mail which dropped to his ankles. They alone were armed with guns, though, indeed, even a few of these



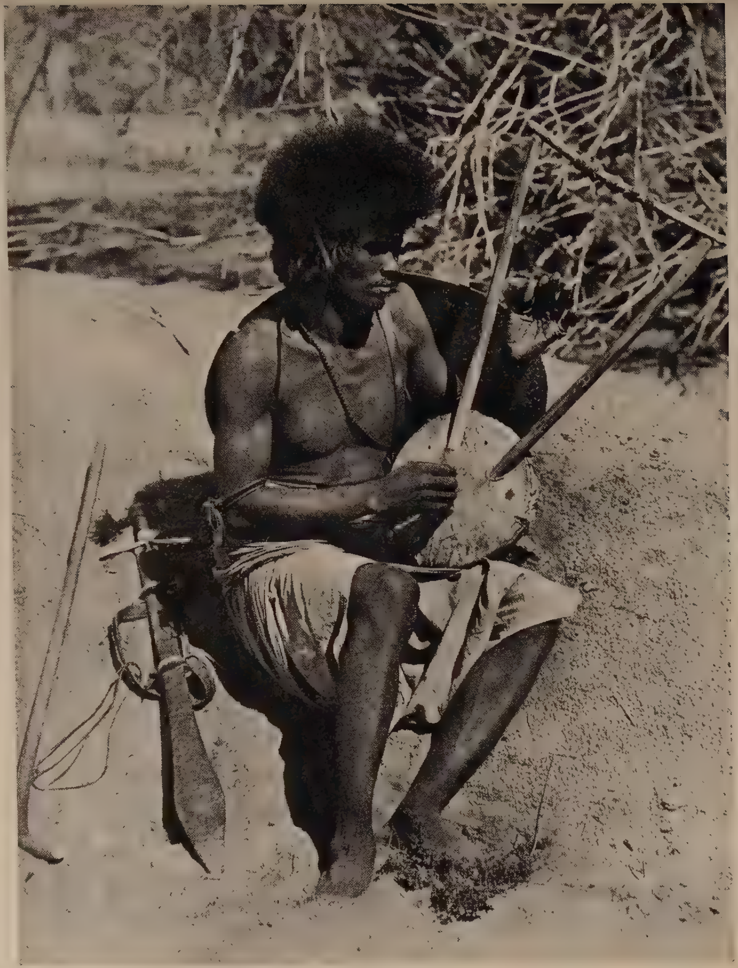
THE NAZIR OF THE MESSERIA RIDES UP IN NOMAD SPLENDOR

At the battle of Omdurman, in which Lord Kitchener, in 1898, broke the dervish power, this patriarch commanded 100 men. Once one of the most notorious of slave raiders, he listens to-day to the yea and nay of



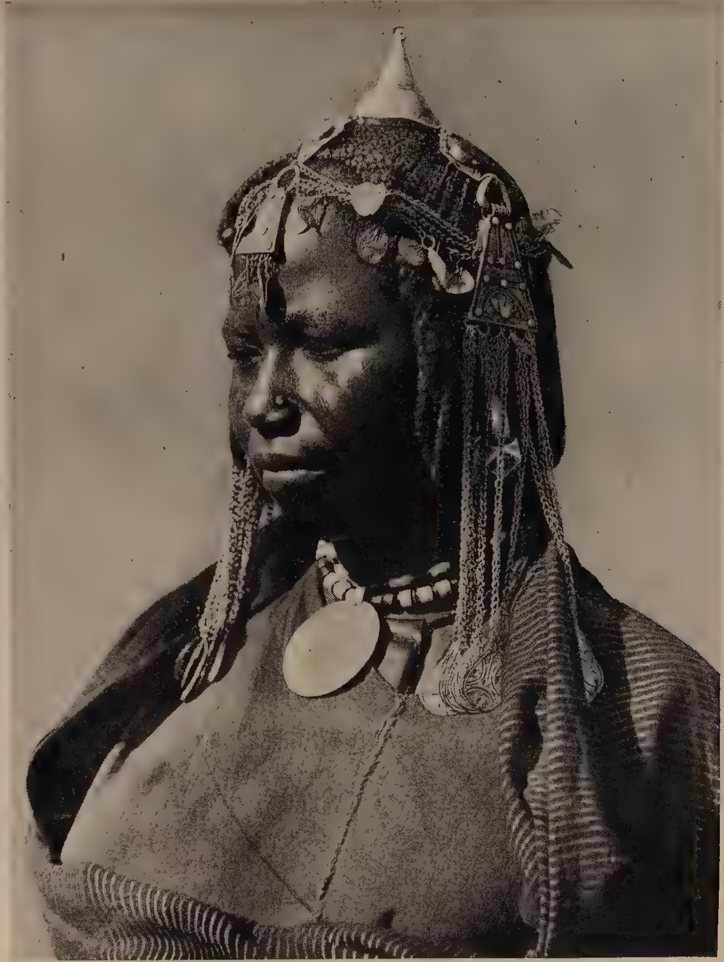
A NOMAD "CRUSADER," DRESSED AND ARMED IN CHARACTER

The Messeria's custom of wearing chain mail and of carrying the straight-bladed, cross-hilted sword, dates from the Crusades. A good Damascus blade and an old suit of chain mail may occasionally be seen to-day, but they are more likely to have been made in Birmingham, England.



A SERENADER OF THE RED SEA HILLS

There are bards in every small tribe, and this is the usual form of stringed instrument used among the Amarar.



COIFFED WITH PRECIOUS METAL

A form of headdress made of silver and light in weight is worn by Messeria girls. The nose button is common among the women.

"BIG BLACK BOUNDIN' BEGGARS" ON THE MARCH

"For you broke a British square!" Such is the refrain of Kipling's ballad of the Sudan Expeditionary Force. These men are Amarar, who, with the Beni-Amer and Hadendoa, are known as the camel tribes of the Red Sea Hills, as distinguished from the horse tribes of Kordofan.

carried the familiar big-bladed spear (see page 471).

It seemed strange to see nomad warriors clad in armor such as our own European ancestors wore in the Middle Ages. As a matter of fact, this custom, in many parts of this region, is directly handed down from the Crusades, as is the type of straight-bladed, cross-hilted sword so much like that of many a European knight who left his bones to bleach in the sands of Syria and Palestine. Now both armor and swords more frequently come from Birmingham, England, than from anywhere else, though occasionally one finds a good Damascus blade or a suit of chain mail dating from ancient times.

As the chief rode up to us and halted, he smiled, and this smile seemed to change him from a warrior chieftain into a very gentle patriarch. But the sub-mahmur (native assistant to the District Commissioner) said: "Ah, the Nazir has killed many men with his own hand in the old dervish days. He was a commander of a hundred men at the battle of Omdurman and was one of the most famous of the slave raiders."

And now one lone British official sits at Abu Zabad and says to this chief yea or nay, and the old killer and slaver obeys absolutely!

But it is the policy of the British to leave as much power as possible with the native chiefs; so the Nazir holds court among his own people for minor offenses. According to the sub-mahmur, the Nazir can fine a thief the value of the goods stolen, and can fine a man the equivalent of ten dollars for "house trespass." As

WHEN BRITAIN CALLED, THE FUZZY-WUZZIES CAME FORTH

Though only a handful of white men rule this vast country, they have made the Empire's name respected to the four corners. At the request of the British authorities, an Amarar chief promised that 100 of his men would ride in to the Americans' camp at the edge of the Red Sea Hills; more than 500 natives responded (see text, page 485).

these people live as nomads and have no houses, this term was puzzling to us. The sub-mahmur explained that it means the old, old sin of the Seventh Commandment. He said the man pays, the chief keeps the fine, and the woman goes unpunished. We wondered what the husbands thought of this system.

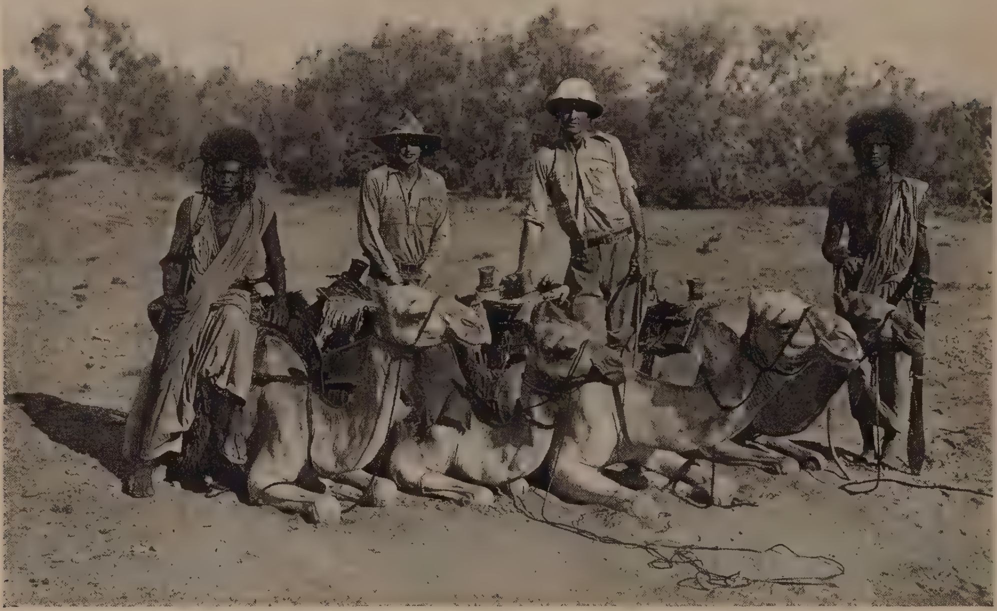
"ONLY FOUR OR FIVE WIVES AT A TIME"

During our days at his camp we frequently went to sit by the Nazir's fire, as he did by ours, and we noticed that there were many good-looking girls in his camp. Some, we were told, were the wives of his son, and some were his own daughters, and some were just relatives; but four or five of the youngest and fairest were his own wives. "He never has more than four or five wives at a time," the sub-mahmur explained. "But he changes wives often. He likes plenty divorces, plenty new wives."

THE NOMAD LIFE IS A GOOD LIFE

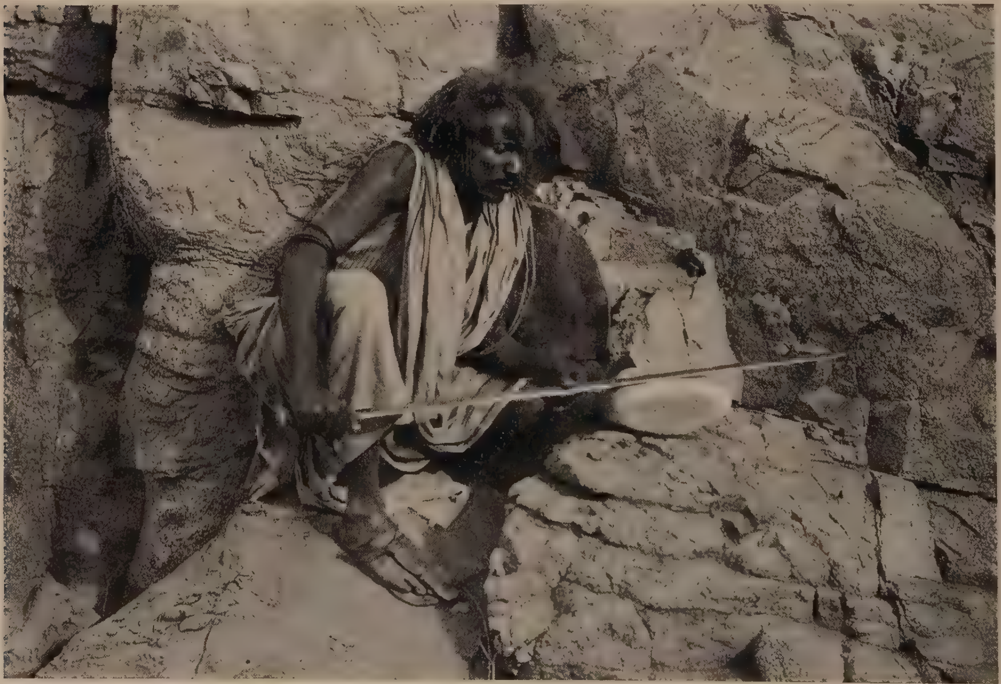
It was pleasant living with this old chief and his nomad people. At night Schoedsack and I often used to say that, judging from our own experiences, most of the warlike tribes of savage peoples were the easiest to get along with. Among such tribes we have always found fine hospitality, a keen sense of humor, and freedom from petty sulkiness. Thus were the Messeria. It was hard to believe that all of the middle-aged and older men who were treating us with so much courtesy had been noted savage warriors of the dervish empire, killers and slave raiders.

The nomad life is a good life. No



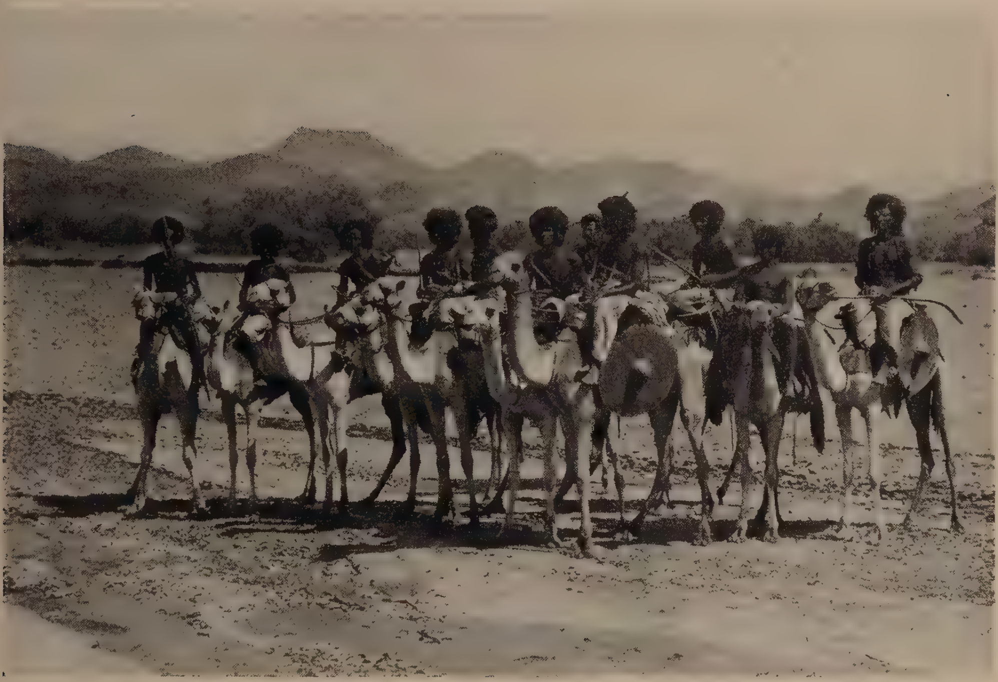
THE AUTHOR AND PHOTOGRAPHER MAKE FRIENDS WITH THE FUZZIES

At first the British authorities hesitated to allow the Americans to live among these tribesmen. Finally, however, the coveted permission was obtained.



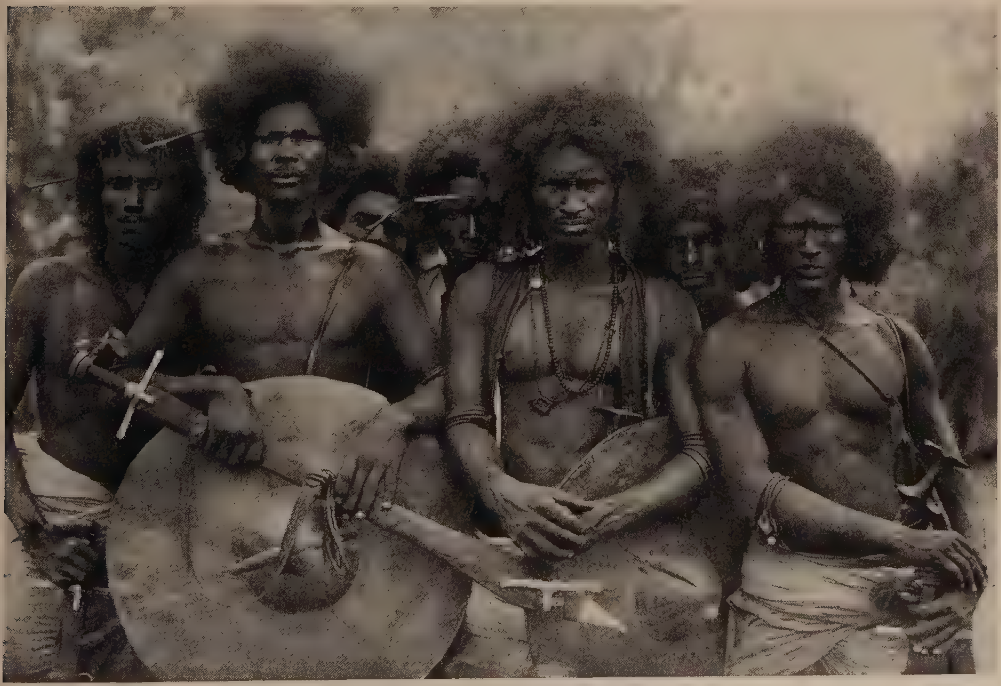
A FUZZY AMUSEMENT—SHARPENING HIS SWORD

Most of these weapons are kept as sharp as razors and often wear through the scabbard. Caution is necessary in drawing the sword, lest it come through and cut the hand.



THE FUZZY SKIMS THE GROUND ON HIS LIGHT RACING CAMEL

It is the usual custom in riding to sit with one foot hooked under one ankle and the free leg thrown over the front of the animal.



FUZZIES IN BATTLE ARRAY

Stripped to the waist, they are ready to fight. The swords are of the cross-hilted, Crusader type, and the heavy round shields are of elephant or rhinoceros hide.

THE AMARAR HAVE A SPECIAL TECHNIQUE IN DELIVERING A SWORD BLOW

question of it. The people are happy. Always changing about, always on the move, and with an intense delight in simple pleasures. How the women love to dance! And as for that, the young men, too. I find in my diary:

"The women commence dancing with two simple dances, to the sound of clapping hands and a chant, about 11 o'clock in the morning. It is 8 o'clock at night now—the moon and campfires are the only lights—yet the dancers are still going strong, apparently not at all tired.

"Schoedsack and I were out with the warriors all the afternoon. They staged a beautiful charge for us over terrifically rocky ground, only killing one horse, but no men, and when we arrived back in camp with them we stopped at the dance.

"Thirty or forty of the gold-and-silver-ornamented women were sitting in a circle clapping their hands and singing. Behind them stood dozens of the youths and older women, and as the mounted warriors rode in they, too, stopped to look and listen, and many of the younger men threw themselves off their horses and drew close to the dancers.

"As we walked up, all made way for us, until we had reached the edge of the inner circle. Then we could see five graceful young girls facing one man. The girls were alternately advancing and retreating as they danced—at first slowly, rhythmically, and then, still keeping the rhythm, with an ever-increasing speed.

"Suddenly, before Schoedsack and I realized what was happening, the women, still unsmiling, not changing their rhythm at all, turned and danced right up to us. When they were almost touching us, the five of them stopped as one, shook their braided curls in our faces, and then hastily retreated—as did we."

THE NUBAS DWELL IN SECRET CAVES

During the first few days, and we did not stay long, more and more feriks of the Messeria kept coming in.

At first the Nubas used to walk over from their little village. We visited one of them—a group of dirty little thatch and mud houses with cylindrical grain storehouses and a pet ostrich running freely about the place (see page 464). We became friendly with these Nubas.

But with the coming of more and more Messeria the Nubas became shier, for they and the Messeria had been deadly enemies for generations. They were both, in their way, splendid fighters; but the Messeria were better armed and, of course, being nomad horsemen, they had a mobility in surprise attacks which often proved disastrous to the Nubas.

The only safety of the latter, after the Messeria became armed with guns, was to retreat into the fastnesses of the mountains, where, in hidden caves unknown to any but themselves, even unto this day, they found secure retreat. Many of the Nuba villages are so built as to make them practically cliff dwellings.

HE RARELY GOES UNACCOUTRED FOR TROUBLE

As a rule, only the young men among the Amarar wear these heavy mops of hair.

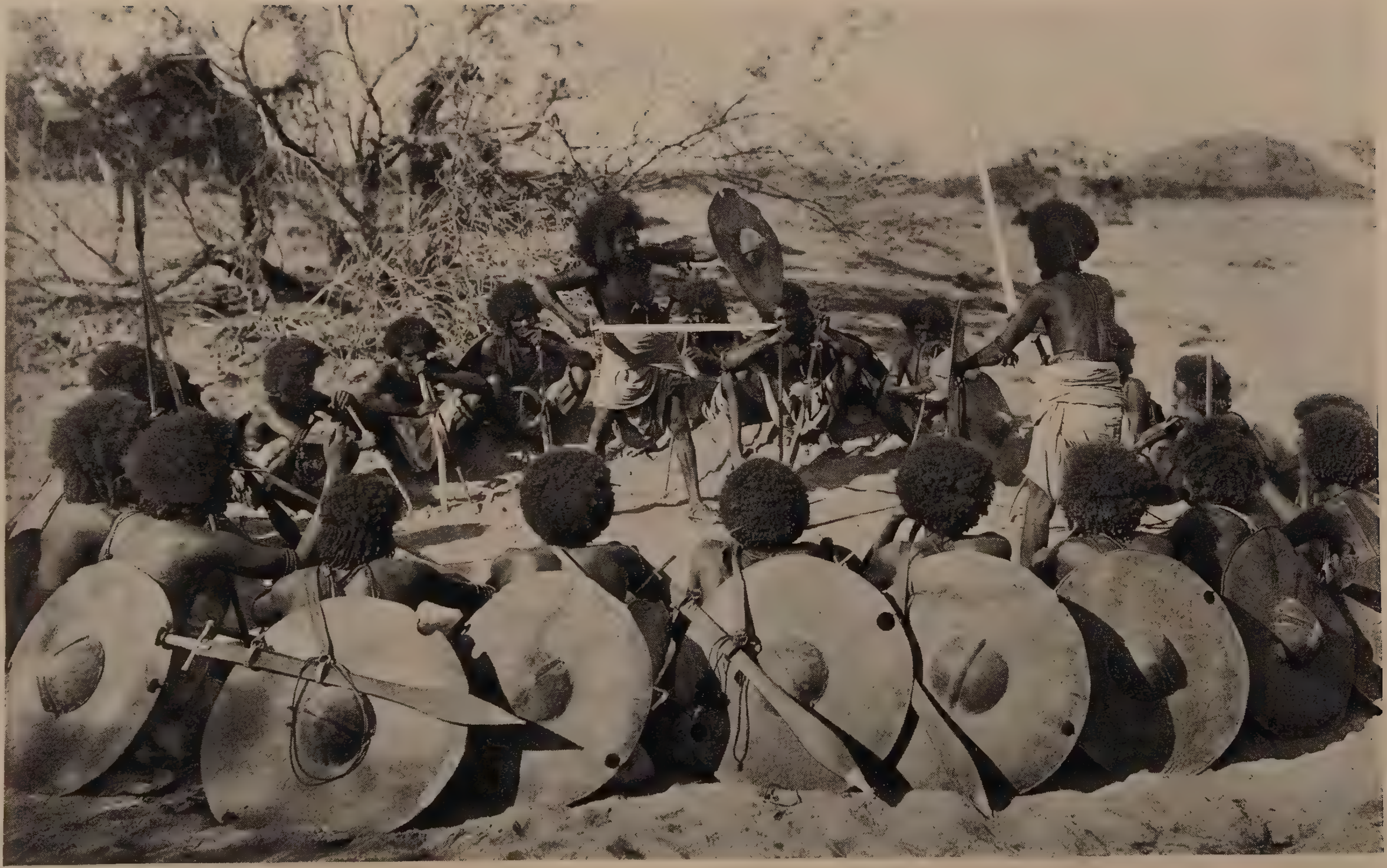
Accompanied by the Nazir, we stopped one day before such a cliff village. The Nazir looked up reflectively at the conical-shaped mud and thatch houses which dotted the ledges of the cliff side and told us how he and his men had one day attacked this same village. They had surprised it and, dismounting at the foot of the cliff, picked off the Nuba men with their rifles before they could escape. "We took back with us many, many slaves," said the old Nazir, and smiled his gentle, sweet smile.

We thought that it might make an interesting picture to stage such an attack by the men of the Messeria on the Nuba village which lay close to our camp; so we sent for the "sultan" of the Nubas, and the bearer of this gorgeous title, a ragged, half-naked old fellow, came into camp, accompanied by a dozen of his followers, equally unkempt and wild-looking.

The Nazir of the Messeria joined us, together with some of his chief men. We explained what we wanted, and in a minute the two old lads were eagerly discussing the idea, the sultan's enthusiasm having been aroused by a promise from us of much sugar and cloth. But his followers shook their heads.

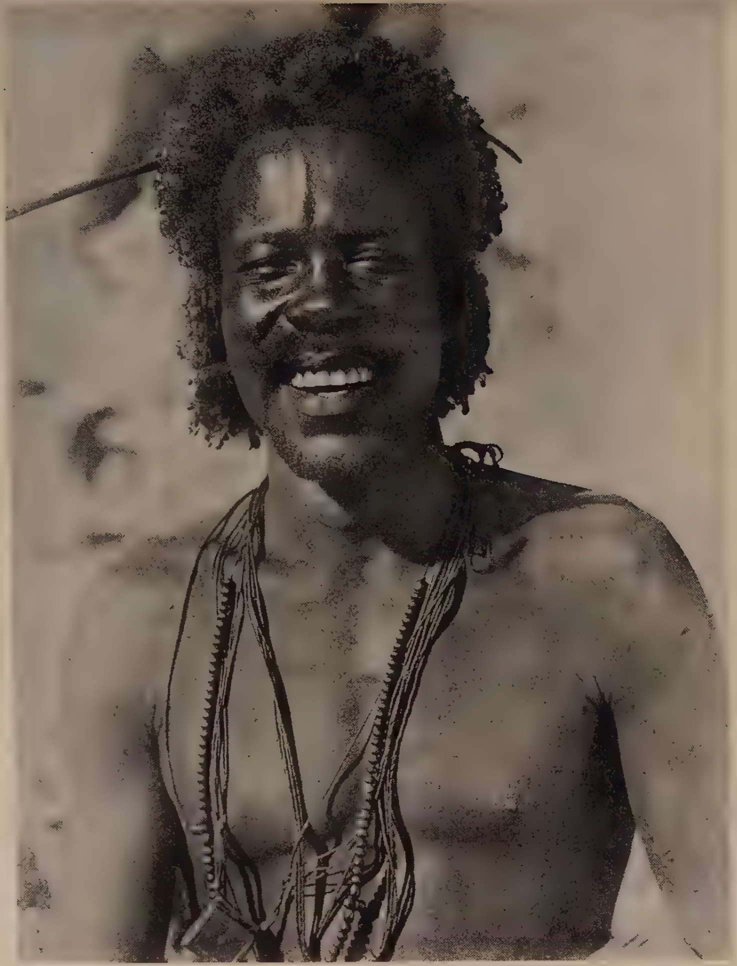
We said to the Nubas: "Oh, but there will be no danger. No one will be hurt. This will not be real, only a game. You and the Messeria will only play together."

"Play!" cried one of the Nuba men.



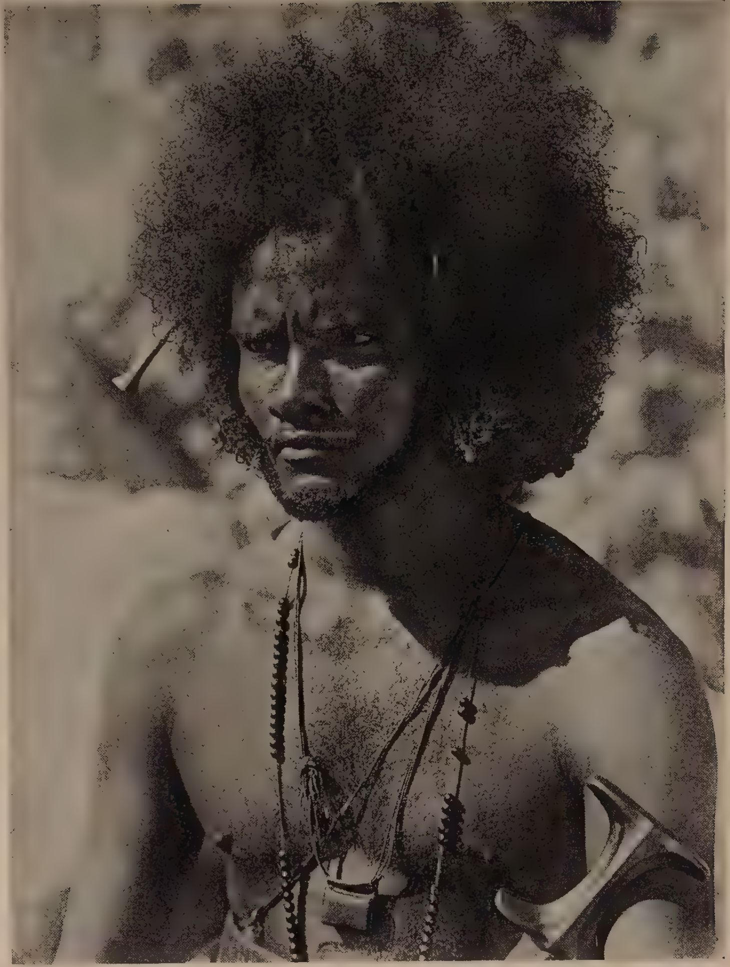
FROM BOYHOOD THE FUZZY IS TAUGHT TO USE THE SWORD

One of the first dances he learns is the sword dance, a violent performance, in which two men leap up and down and cut at each other with their swords, being careful, however, to miss.



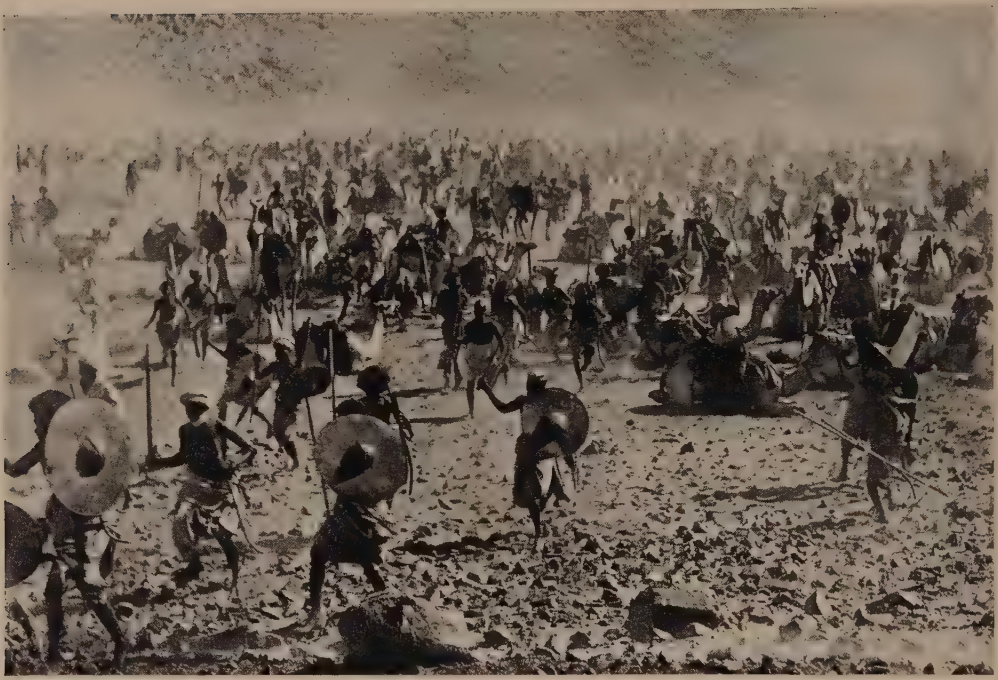
ONE OF AFRICA'S "TALLEST AND FINEST OF MEN"

More than 2,000 years ago Herodotus identified the Beja family of tribes, to which the Amarar belongs, with the handsome Macrobii, and this Fuzzy-Wuzzy still bears out his description.



THE FUZZY'S "'AYRICK 'EAD OF 'AIR"

The peculiar mop is held in place by being soaked in sheep fat. The long pin of ibex bone, sometimes silver-mounted, is used to scratch at the numerous tiny residents of the big headdresses.



THE FUZZIES DISMOUNT TO CHARGE INTO A SHAM BATTLE

When they go into a fight, they obtain greater freedom in arm action by stripping to the waist and wrapping the upper part of their flowing garment about their middle.

"These Messeria will not play. They will kill us. We know them."

The Nazir promised to control his men, but I could not help remembering what he had said that very morning as he had watched the armed column of his spearmen ride down the path to camp.

"When we used to ride like that the vultures would gather and fly along to accompany us. They knew they could expect food." And then he shook his head sadly at these present degenerate times.

However, we decided that, after all, we had no place in our picture for such a raid, and called it off, to the great chagrin of the Nazir.

At last one day there was a great giving of sugar and cloth, and we were off to leave the Messeria behind us and go many hundreds of miles away to the eastern Sudan.

AMONG THE FUZZY-WUZZIES

Now here, where the Red Sea Hills look down over that treacherous body of water from which they have gained their name, live the most famous of all the Sudan fighting tribes. In the long years of conflict with the British around Suakin, when this old slave port was the only foothold which the whites were able to maintain on that coast, the British Tommies gave them the name of "Fuzzy-Wuzzies" because of the enormous heads of hair of the young warriors of the tribes. Of them Kipling wrote:

We've fought with many men acrost the seas,
An' some of 'em was brave an' some was not.
The Paythan an' the Zulu an' Burmese;
But the Fuzzy was the finest of the lot. . . .

So 'ere's *to* you, Fuzzy-Wuzzy, at your 'ome in the Sudan;
You're a pore benighted 'eathen, but a first-class fightin' man;
An' 'ere's *to* you, Fuzzy-Wuzzy, with your 'ayrick 'ead of 'air—
You big black boundin' beggar—for you broke a British square!

Actually these Fuzzies belong to three tribes—the Hadendoa, the Beni-Amer, and the Amarar. No one knows much about their ancient history, but they are supposed to be of the original Hamitic people of this coast. Though now Mohammedans, many of their customs and their language are quite distinct from the Arabic.

They well deserve the reputation for courage which Kipling gave them. Thou-

TEACHING TABLE MANNERS TO THE CAMEL

When a Fuzzy feeds his mount, he usually spreads a cloth and lets the animal eat delicately from it. This prevents the grain from being scattered.

sands of them, more than once, though armed only with sword and shield, charged across the open desert against the concentrated fire of rifle and Maxims. Once started on a fighting charge, only death could stop them.

But we had read and were told that, in addition to a reputation for courage, they were to this very day sullen, quarrelsome, vindictive, and dangerous. Our first request, that we be permitted to live among them and take pictures, was absolutely refused by the British authorities. In the end, however, with the kindness and courtesy continually shown us during our six months in the Sudan, the authorities graciously agreed.

We went out from Port Sudan to a spot on the edge of the hills some 20 miles away, where we pitched our tents near a little stone house built some years before by the engineer who had arranged for piping water down to the town. There we waited.

The chief who had conferred with the British Deputy Governor and District Commissioner at Port Sudan had promised that a hundred of his men of the Amarar tribe, always friendly to the British, even in dervish times, would come in. Instead of 100, more than 500 rode in.

They were as fine-looking a crowd of fighters as I have ever seen. Every man was dressed in white robes and was mounted on a camel; nearly every one carried a cross-hilted Crusader sword and a heavy round shield of elephant or rhinoceros hide. Most of them had straight features and were erect and athletic-looking.

The younger men had heads of hair which would be the pride and despair of any wigmaker for private theatricals.

The swords and shields these men carried at all times were not simply for show. They used them on occasions for fighting. Every boy is taught to fight, and by the time he reaches manhood has become a marvelously dexterous swordsman.

A DUEL WITH STONES

Nearly all major quarrels are settled with the sword, but for minor ones they have an amusing way of dueling.

Two men quarrel. They strip to the waist by wrapping the upper ends of their white cotton robes around their middle, and then each man takes his place within a small circle marked around him in the

FUZZY ON THE RUSH

He well deserves the reputation for courage which Kipling gave him. When once he started on a fighting charge only death could stop him.

sand. The two circles are some yards apart. Then by each man and within the circle is placed a large pile of small stones about the size of baseballs. Each fighter carries his shield in his left hand. Each takes a stone in his right hand. At a signal they let fly at each other, and then keep up a continuous volley of stones.

They may dodge, they may catch these stones on their shields, they may jump over them, but cursed as a coward be the first man who steps out of his circle in retreat. Now, when one knows that with these people stone-throwing is developed to such a fine art that they pursue ibex in the mountains and kill them with stones, one can realize what a fierce affair this kind of fight may amount to.

A stone duel between two men can be serious, but not nearly so bad as when two entire tribes start stone-throwing. We came close to having a sample of this. One day we had taken a picture of our 500 warriors riding by on their camels, and were on our way back to camp, when we were startled to hear a tumult in a near-by gorge. We rushed down to find a couple of hundred of our Fuzzies stripped to the waist—a sure sign of battle—and about to attack each other both with stones and swords.

Luckily, we succeeded in quieting them before real fighting started.

If anyone is killed in such fights as these, a blood feud starts which is difficult to stop. Sometimes it can be arranged by the payment of blood money, but frequently relatives of the dead man will hunt down any member of the killer's family and cut him to pieces. And they are not particular as to how or when. They are as pleased as not to catch him while asleep.

But, despite these reputed qualities, we found the Fuzzies to be good fellows, and the six weeks or so we spent with them were very happy ones to us. We left the Sudan with only pleasant recollections, and certainly we remember it as the best-administered territory in which we have ever traveled.

SUMMER HOLIDAYS ON THE BOSPORUS

BY MAYNARD OWEN WILLIAMS

AUTHOR OF "SEEING 3,000 YEARS OF HISTORY IN FOUR HOURS," "IN THE BIRTHPLACE OF CHRISTIANITY," "UNSPOILED CYPRUS," ETC., ETC., IN THE NATIONAL GEOGRAPHIC MAGAZINE

With Illustrations from Photographs by the Author

AFTER the most severe winter in 67 years, summer has returned to enliven the Bosporus. Where snow lay deep, picnic parties revel in cool shade. Where, on March 1, 1929, floe ice from the Black Sea almost bridged the blue, so that incautious observers assert that a nimble-footed Eliza could have crossed from Europe to Asia, frail craft with lusty outboard motors now skim the sunny bays and diplomatic launches give an aristocratic air to a popularized playground.

Graceful caïques have been newly belted with crimson and gold and at the bobbin-handled, swallow-tailed oars bare-armed girls take wrinkled boatmen for a ride or shout laughing challenge to loud-shirted rowing crews.

Al fresco restaurants occupy the emplacements of once powerful batteries, their guns destroyed. Freedom from military restrictions has turned the whole 18-mile strait into a suburban bathing beach and picnic ground.

For trippers and commuters alike, the Bosporus begins at Galata Bridge, Constantinople's Grand Central, whence comfortable steamers depart seventy times a day. One may live in Istanbul for months without seeing a train. In fact, one must take a ferry to reach a truly Turkish railway. But caïques and *chirkets* are as essential as gondolas in Venice.

When snowdrifts delayed the trams and buried whole rows of taxicabs in the city streets, we walked; but when the Black Sea ice confined the Bosporus boats to their piers, business was disrupted.

LATE ARRIVALS SCRAMBLE FOR TICKETS, CAKE, AND RAKI

For all its infamous currents, changing moods, and adverse winds, the Bosporus is our most reliable highway. How better see it than by joining the happy throng and week-ending along its waters? Moslem, Hebrew, and Christian will each lend us a holiday—and their company.

The *Mendicant Monk,* already loaded far beyond its quota of 1,060 passengers, awaits late comers, who are scrambling for tickets, having their shoes shined, or buying ring-toss loaves sprinkled with sesame, comic journals satirizing each other in New Turkish and Greek, hazelnuts and raisins, sponge cake and bottles of *raki*—for times have changed since Commodore William Bainbridge, who first carried the American flag up the Bosporus to the Black Sea, served fresh water from four continents to his abstemious Moslem guests. Drinking alcohol in Turkey is no longer a Christian prerogative.

We glide smoothly away from our pier, thread our way through the commercial port off Galata Quay, and begin to buck breeze and current. From a coquettish sailboat, a bobbed-haired girl in a bright bathing suit broadcasts a friendly wave. Passengers, failing to notice that cushions have transformed this wind-swept forward deck from second class to first, argue about fares.

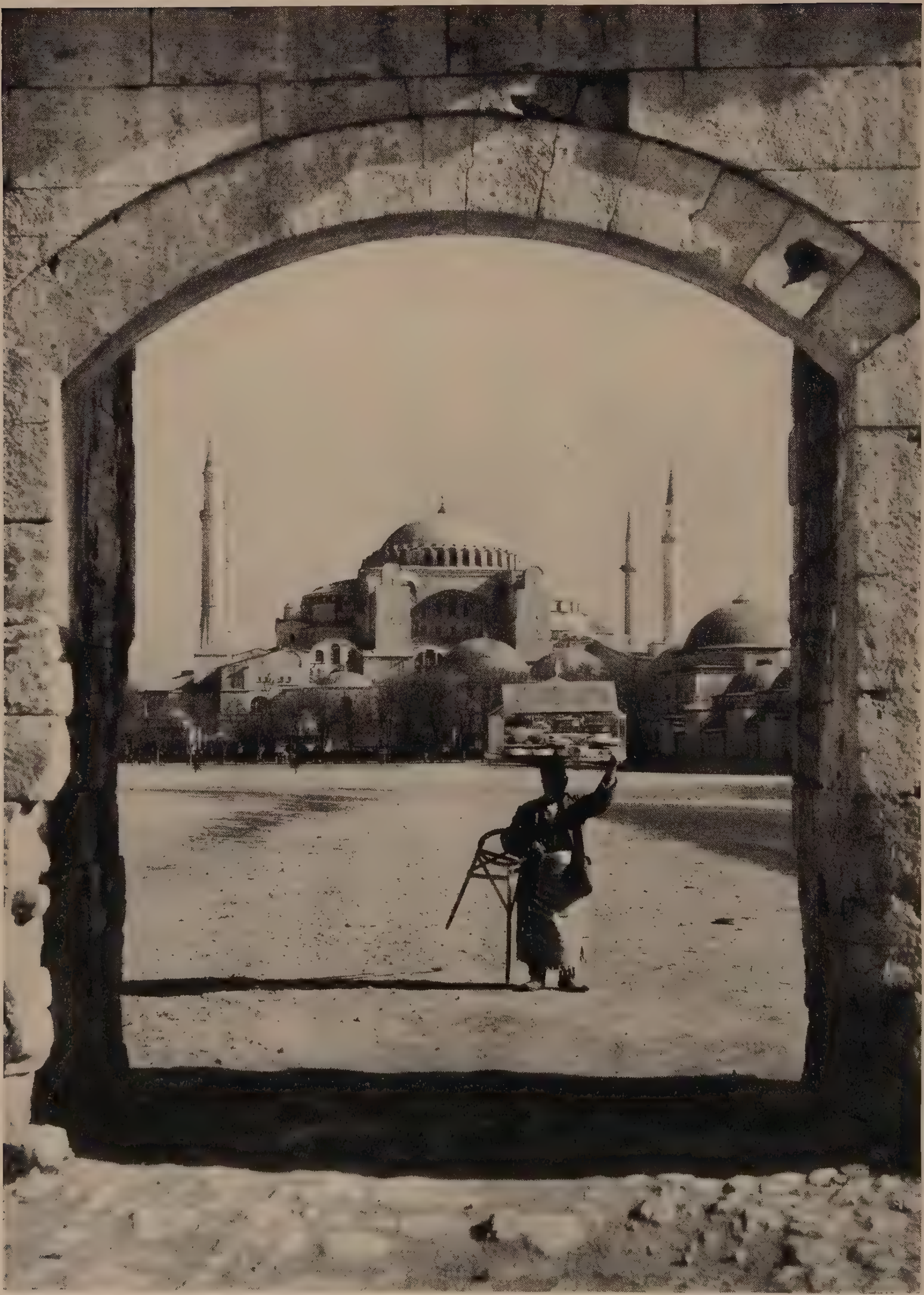
RUINS OF PALACES RECALL STIRRING HISTORY

We pass the long façade of the Palace of the Filled-in Garden, near where Mohammed's 68 war galleys started on rollers over the ridge of Pera to the Golden Horn, during the siege of Constantinople centuries ago. Then follow minor palaces, sometimes duplicated because a henpecked polygamist had to treat two wives alike—or an absolute autocrat, two daughters.

High on the hill and hidden amid greenery behind double walls is the Yildiz Kiosk (Palace of the Star), formerly a retreat of the deposed Abdul Hamid and, for a few hectic weeks, a gambling casino.

Beside us is the roofless ruin of Cheragan, on which Abdul Aziz lavished his time and money until he stubbed his toe on its threshold. For 28 years the prison of Murad V and Parliament House for a few months, it was burned in 1910.

Beyond another ruin, half-buried in soft coal, we come to the Middle Village (Orta Köi). A crescent of caïques and sailing ships curves around to where a beautiful



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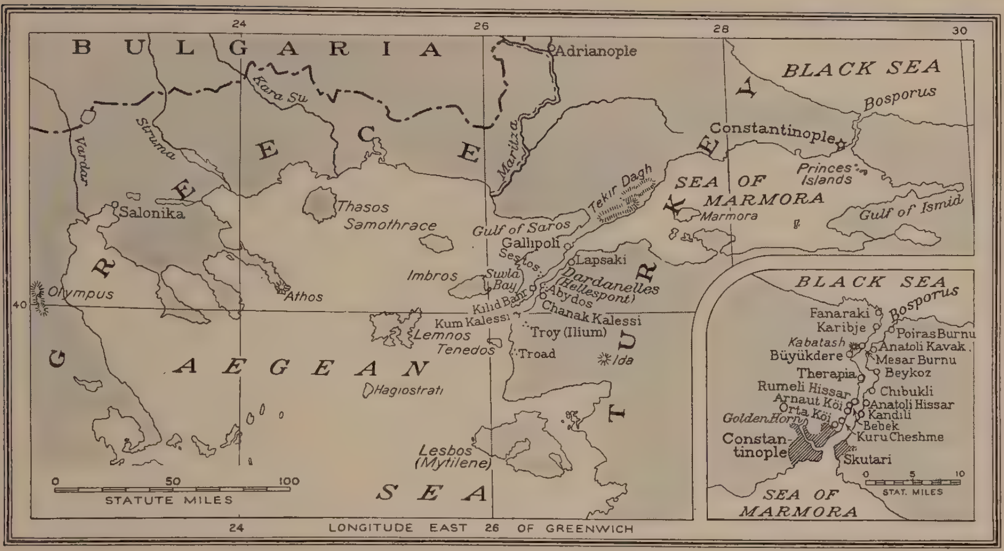
TO MANY PEOPLE, CONSTANTINOPLE MEANS NOTHING BUT SANCTA SOPHIA

To thousands who have never even heard of the city's battered walls, and who have never formed a mind-picture of the romantic Bosporus, the name of this venerable structure is a familiar sound. Its confused and shapeless pile is bounded by four massive minarets and encased in gigantic buttresses.


BULGARIA
GREECE
TURKEY
AEGEAN SEA
BLACK SEA
Bosporus
Constantinople
Princes Islands
SEA OF MARMORA
Marmora
Gulf of Ismid
Adrianople
Kara Su
Struma
Vardar
Maritza
Salonika
Olympus
Athos
Thasos
Samothrace
Gulf of Saros
Gallipoli
Sestos
Lapsaki
Tekir Dagh
Imbros
Suvla Bay
Kilid Bahr
Abydos
Dardanelles (Hellespont)
Chanak Kalessi
Kum Kalessi
Lemnos
Tenedos
Troy (Ilium)
Troad
Ida
Hagiostrati
Lesbos (Mytilene)
0 50 100
STATUTE MILES
24 26 28 30
40
LONGITUDE EAST 26 OF GREENWICH
BLACK SEA
Bosporus
Fanaraki
Karibje
Kabatash
Büyükdere
Therapia
Rumeli Hissar
Arnaut Köi
Orta Köi
Golden Horn
Constantinople
Poiras Burnu
Anatoli Kavak
Mesar Burnu
Beykoz
Chibukli
Anatoli Hissar
Kandili
Bebek
Kuru Cheshme
Skutari
SEA OF MARMORA
0 5 10
STAT. MILES

Drawn by A. H. Bumstead

THE BOSPORUS SEPARATES EUROPE FROM ASIA

Along both shores of the strait connecting the Black Sea with the Sea of Marmora are many villages, villas, castles, and the ruins of castles. Its beauty spots, once visited exclusively by the aristocracy of the Turkish Empire, are now picnic grounds for the humbler citizens of the Turkish Republic.

jewel-box mosque admires itself in a water mirror troubled by swimmers.

A stone quay provides a stream-side seat at noon or sundown for old ladies in black and young girls in rainbow hues—Turkish Carmens from an ex-palace tobacco factory. As the ship's wave sweeps along, one party after another retreats before it and then returns to the serious business of zephyr-smelling.

On the edge of Asia, Skutari (recently rechristened Üsküdar in the New Turkish), backed by its cypress-forested Field of the Dead, has dropped astern, and opposite us is the dazzling palace of Beylerbey, which welcomed the Empress Eugénie to rooms copied from her own in the Tuileries.

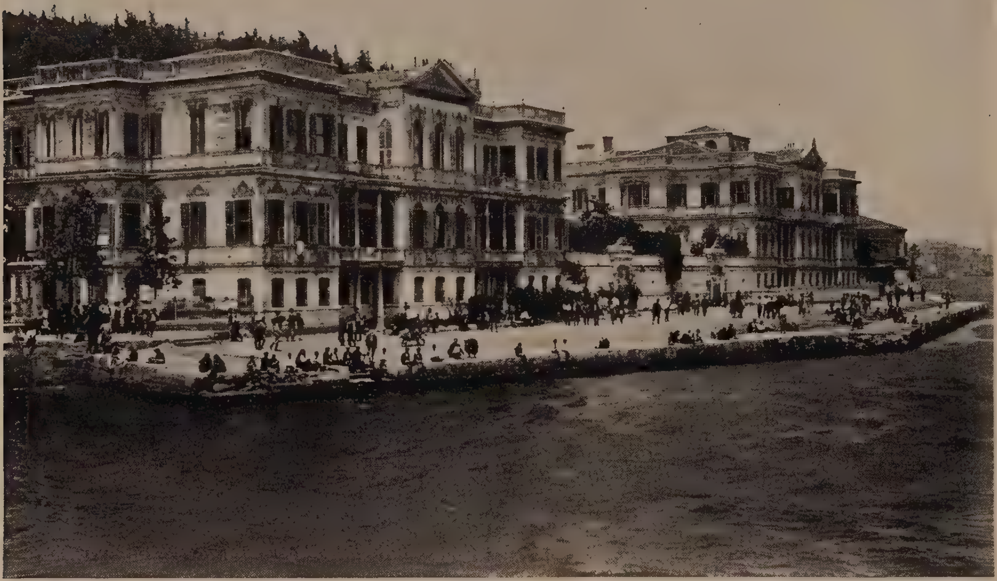
THE MIDDLE BOSPORUS IS THE FAIREST SECTION

The Bosporus, "in flow a river and in depth a sea," may be roughly divided into three zones: Palaces, Pictures, and Picnics. Our course here changes from northeast almost to north, and before us lies the most picturesque region, the middle Bosporus, lacking Stamboul's matchless skyline, but itself the fairest part of this varied panorama.

Above Kuru Cheshme, a pleasant clump of trees and many prostrate Hebrew tombstones mark a point from which there is a marvelous view up-Bosporus (see Color Plate II), with the Albanian Village (Arnaut Köi) at our feet, the Beacon Village (Kandili) across the swift current, and the European and Asiatic Castles in the distance. Stylite hermits, here perched on pillars, suffered bodily cramp while their eyes were tempted to a Sybarite feast.

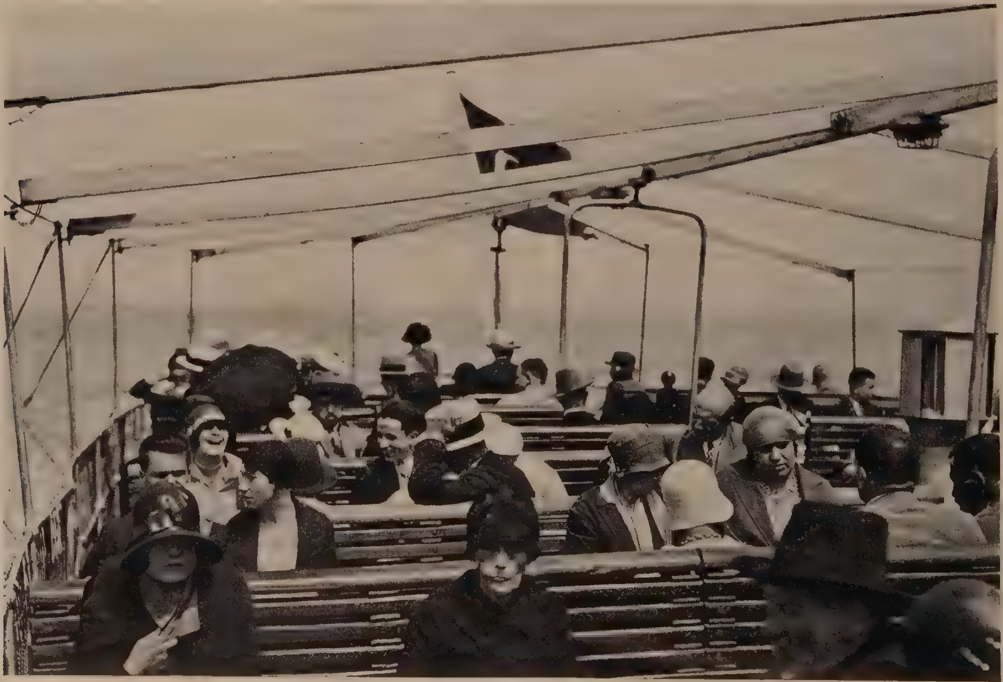
Behind the neglected Hebrew graves rise five splendid buildings of the Constantinople Woman's College (also spoken of as the American College for Girls), a great educational institution and the only one of its class east of Vienna. Thirty-five girl graduates, nine of them with unbobbed hair, have just returned to Armenian, Bulgarian, Greek, Turkish, Hebrew, Russian, Rumanian, and British homes—diverse in race and religion, but fellow alumnæ of one Alma Mater.

At Arnaut Köi (now Arnavutköy), the current is so savage that a signalman with red and green flags is constantly on duty, indicating how closely the steamers may with safety shave this point. Small boats, unable to stem the tide, are hauled by towlines into the backwaters of Bebek.



TWIN PALACES AT ORTA KÖI PERPETUATE FAMILY DIFFERENCES

They were built for two daughters who could not live together, and so were provided with similar homes separated by a high wall. In later days the palaces became a tobacco factory, and at noon the quay along which heavily veiled ladies once strolled was the picnic and lunch resort of factory women. The left-hand palace has been destroyed by fire (see page 507).



HOLIDAY-MAKERS BOUND FOR THE PRINCES ISLANDS

Many prosperous Constantinople Turks maintain summer homes for their families on this Sea of Marmora group, and commute back and forth. At rush hours these efficiently operated boats are as packed as a New York ferry. The ride takes an hour or more from Galata Bridge (see illustration, page 504).

THE BOSPORUS IS A SUMMER PLAYGROUND

Not so different from beach scenes in America or Europe, and the rush for the late-afternoon boats home is just as great. In the background, across the Bosporus, is the Genoese Castle, built by the Byzantines and assailed by Harun-al-Rashid, Caliph of Baghdad; by the Genoese, and by Bayezid I, the Thunderbolt.

BRIDGE AND FERRY COMPETE FOR PATRONAGE

It is a mystery why there should be such an active ferry service just above Galata Bridge. It costs only half a cent to walk across, or half a cent in addition to the tram fare to ride across; yet a constant stream of rowboats makes Constantinople's water front as lively as Venice. This is the landing stage at the Stamboul end. Old Galata Tower in the distance.

On opposite sides of this conveniently treacherous stream were palaces for Seraglio graduates, ex-wives of the sultans.

TAG DAY FOR THE RED CRESCENT—TURKEY'S RED CROSS

Beside the Bosporus at sunset time—it was the Fourth of July and Tag Day to boot—a girl pinned a bit of paper to my lapel, while her equally charming companion stuffed my contribution into a Red Crescent box.

Just then a taxi approached, its flag marked "Bosh," meaning "Nothing in it." The gentle and youthful hand that had just decorated my coat now steadied itself against my shoulder while a narrow white shoe rose to the grasp of a manicured hand.

"Monsieur, let's take a taxi. My feet are tired!"

Seated with these newly emancipated daughters of the East, I asked, "Are you Turkish?"

"But yes! Why not?"

Nor could I say.

AN OUTPOST OF AMERICAN EDUCATION IN THE NEAR EAST

Bebek, at the end of the street-car line, is a place of rare hominess, sheltered in winter and cool in summer. On the hill behind it, occupying the most magnificently located of campuses, is Robert College. Long an outpost of American education in the Near East, it faces its greatest opportunity, now that Turkey, personally and officially, is looking to the West, if not for leadership, at least for inspiration (see Color Plates I and VI).

At a time when Turkey's own schools are making admirable progress, Robert College commands high respect and distinguished patronage. Its engineering graduates, especially, are in great demand.

From an abandoned dervish cloister near the Place of Martyrs, a natural amphitheater slopes down a narrowing valley to a proscenium of ivy-clad gray wall, terminating in stately towers, built in five months and still standing after five centuries.

For a stage, there is the blue Bosporus; for a back drop, the softly rolling hills of Asia, with a stream-split village, where the Sweet Waters of Asia flow into the strait between the scarlet hulls of a native shipyard and the gray walls of the Asiatic Castle (see Color Plate IV, lower).

No view so stirs the occidental mind as that where the towers of the Rumelian Castle frame the fairest edge of Asia. But, to the eye alone, this splendid bastile is best seen at dawn from beyond the reflecting pool of the unruffled Bosporus. Great umbrella pines arch above the view of battlemented walls. Whether they form the name of the Conqueror or not, they are a mighty monument to his energy (see Color Plates I and III).

Above Rumeli Hissar a line of villages parallels the general direction of the S-shaped Bosporus.

Our ship passed the Kiosk of Kalender, now flanked by a public tennis court and crowded with Turkish orphans. Once this place was called the Bay of the Fox. Nor does its diplomatic record belie the name. Before that dread winter of 1812, when the Marseillaise was drowned out by the Russian National Hymn at the walls of burning Moscow, Turkey, abetted by England, here made peace with Russia, thus releasing the Tsar's best troops for the defense of the Kremlin.

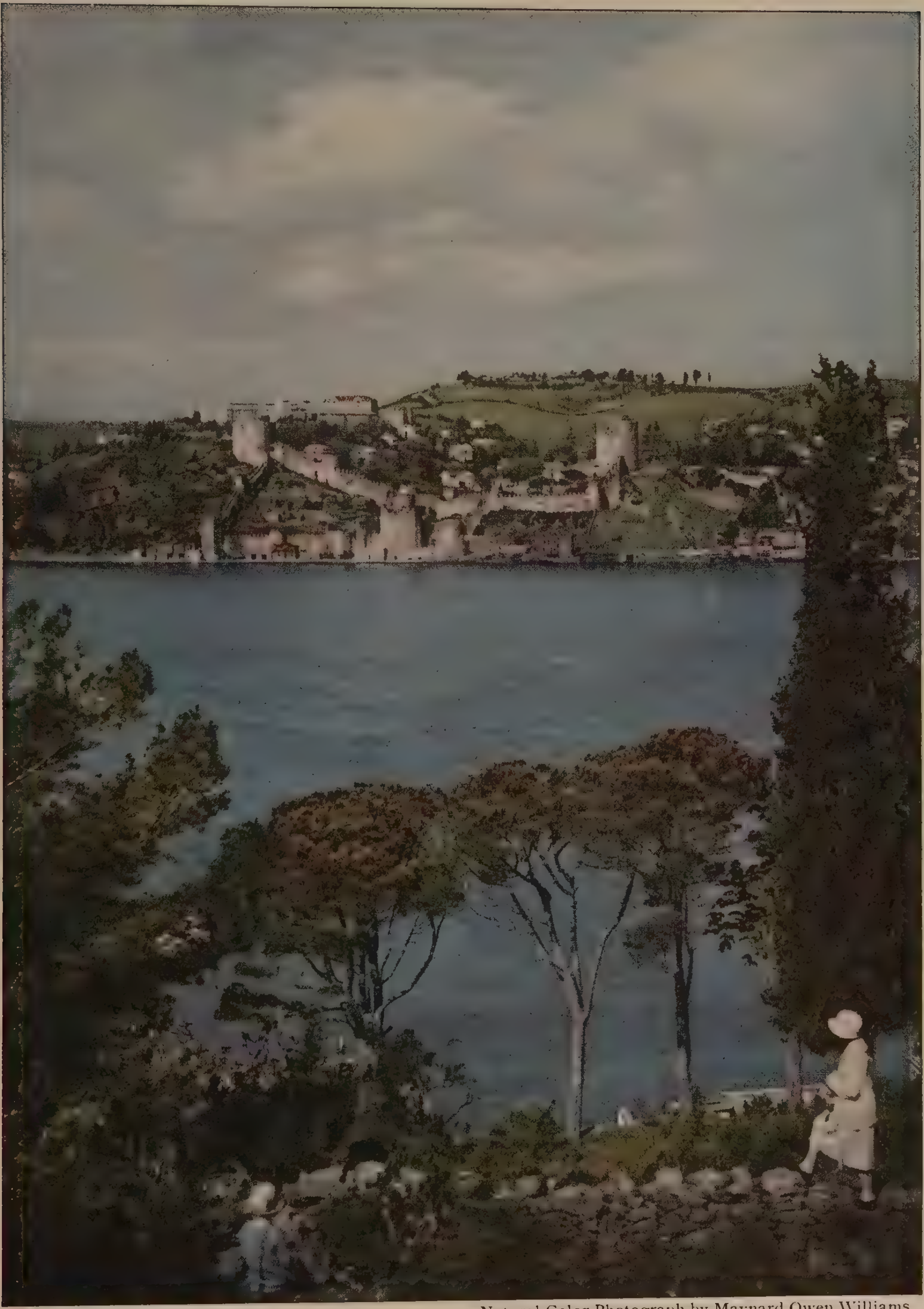
Village of summer embassies and hotels, show place of *nouveaux riches,* and rendezvous of idlers, Therapia (now Tarapya) is as aristocratic as modern life allows, amid high teas and low music.

RUSSIAN MUSIC AND GAY DANCERS

Büyükdere, hydroplane port, is more versatile, beloved by the bourgeoisie and graced by the deeply wooded garden of the Soviet Embassy. Above the landing stage a "Salon Orkestrasi ve Cazband" is soon to start a silk-and-flannel mass milling about to the strains of "Ramona" and "I Kiss Your Hand, Madame."

But that will come only after the real business of the day, eating, is over. The massed green woods between the landing stage and the Cape of the Tomb are private. But back on the slope of Mount Kabatash great trees shade humble "casinos," squealed at by phonographs or enlivened by a gypsy band whose oriental music seems incomplete without a barker, the smell of sawdust, and a striped midway tent.

Here a picnic is mere economy. But beyond Büyükdere it is a passion—almost a profession. At Mesar Burnu passengers



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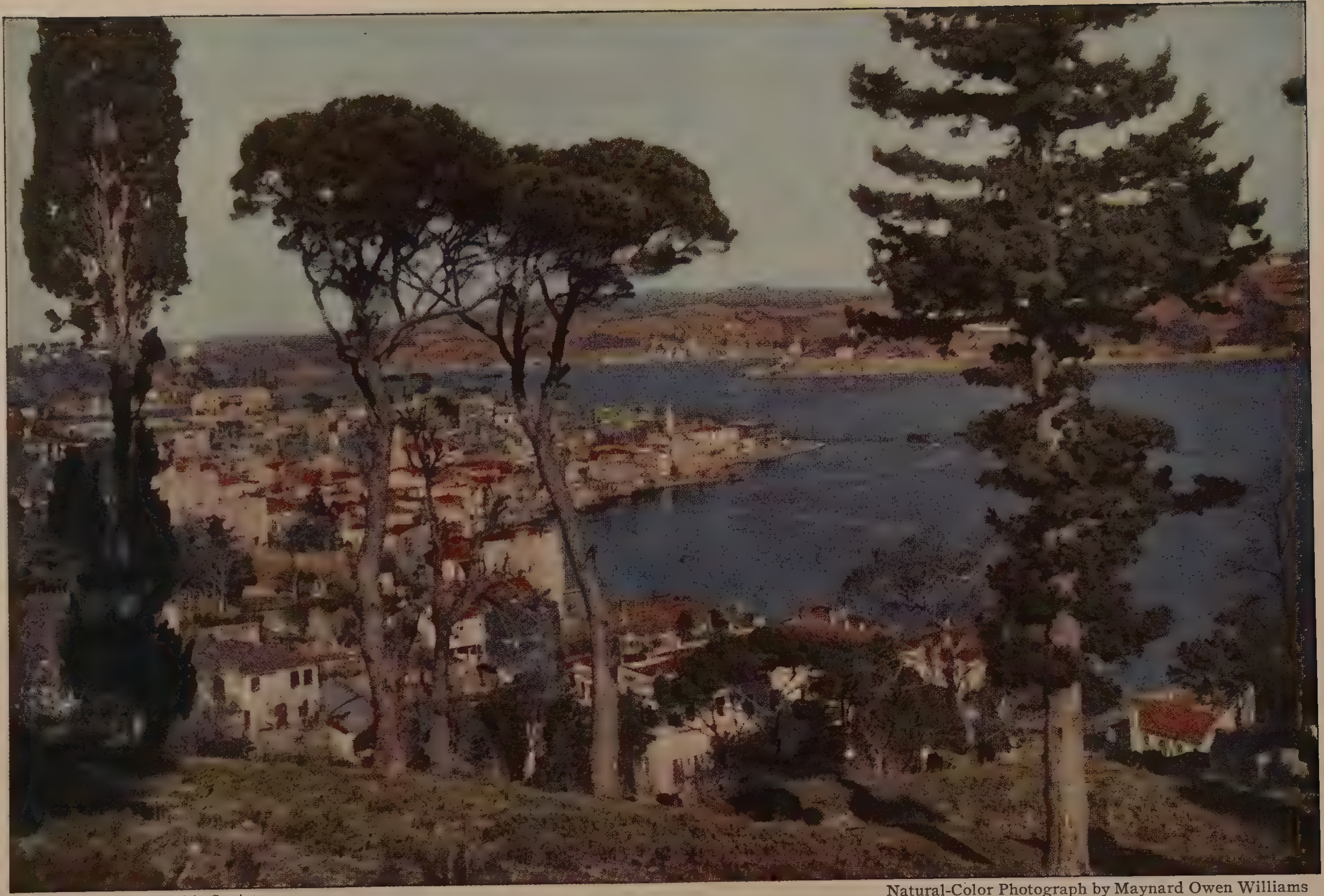
LOOKING ACROSS THE BOSPORUS FROM ASIA TO EUROPE

Rumeli Hissar, Mohammed's "European Castle," in the 15th century prevented Black Sea grain from reaching besieged Constantinople; Robert College, its near neighbor on the hill to the left, now carries American education to the changing East.



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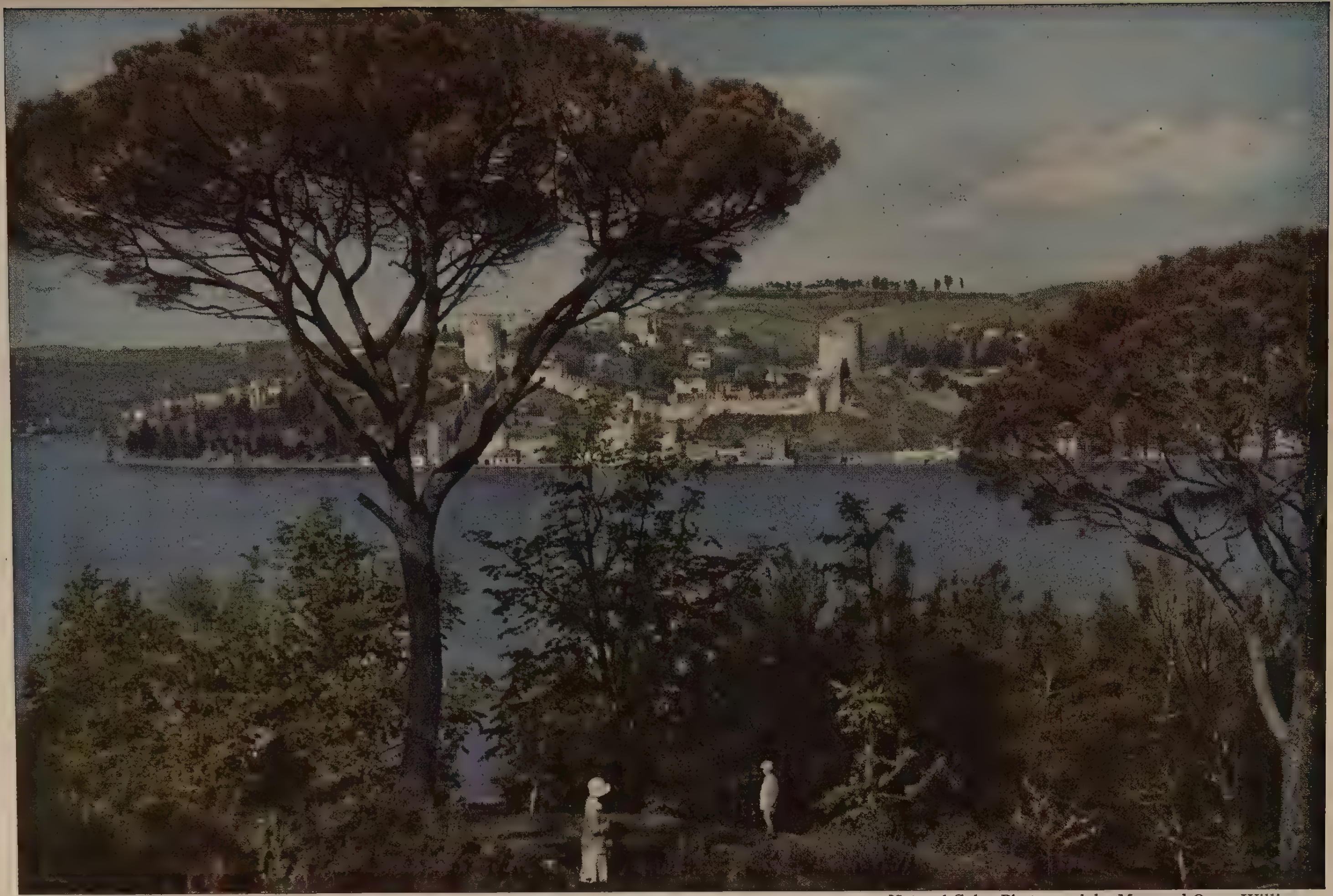
Natural-Color Photograph by Maynard Owen Williams

"TITANIC FORCES HERE RENT EUROPE AND ASIA ASUNDER"

Winding, but parallel, shores direct the Bosporus from cape to cape. At Arnaut Köi, recently rechristened Arnavutköy, a steamer is breasting the strongest current of this narrow 18-mile-long divider of continents. Just below the hill from which this view was taken is the entrance to the Constantinople Woman's College. Near here there were, in olden times, many pillar hermits, among them Daniel the Stylite, who lived on top of a column for a third of a century.



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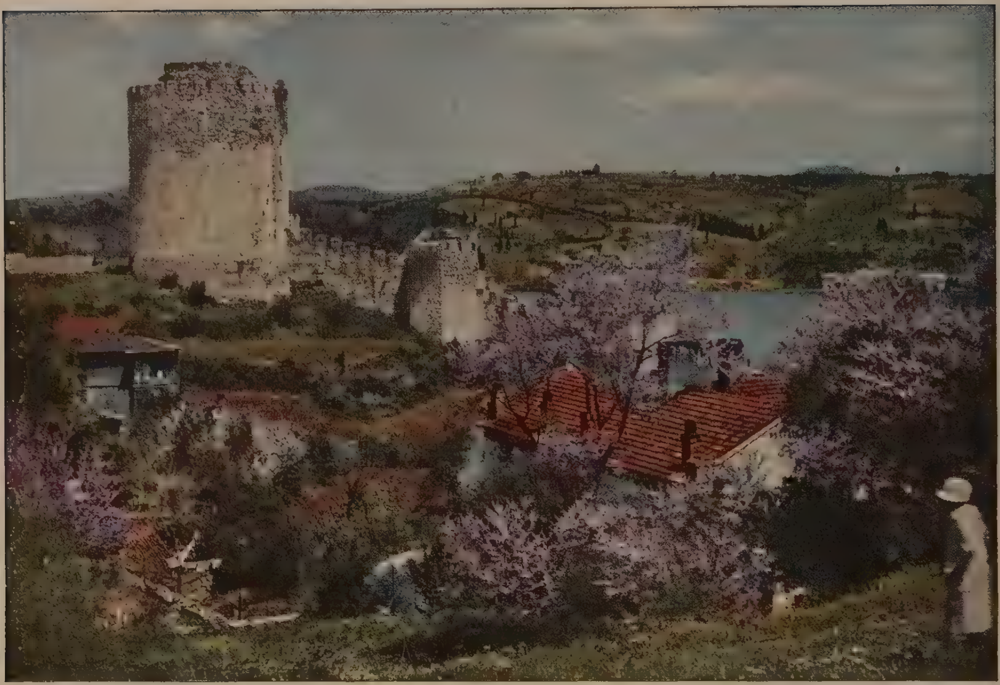
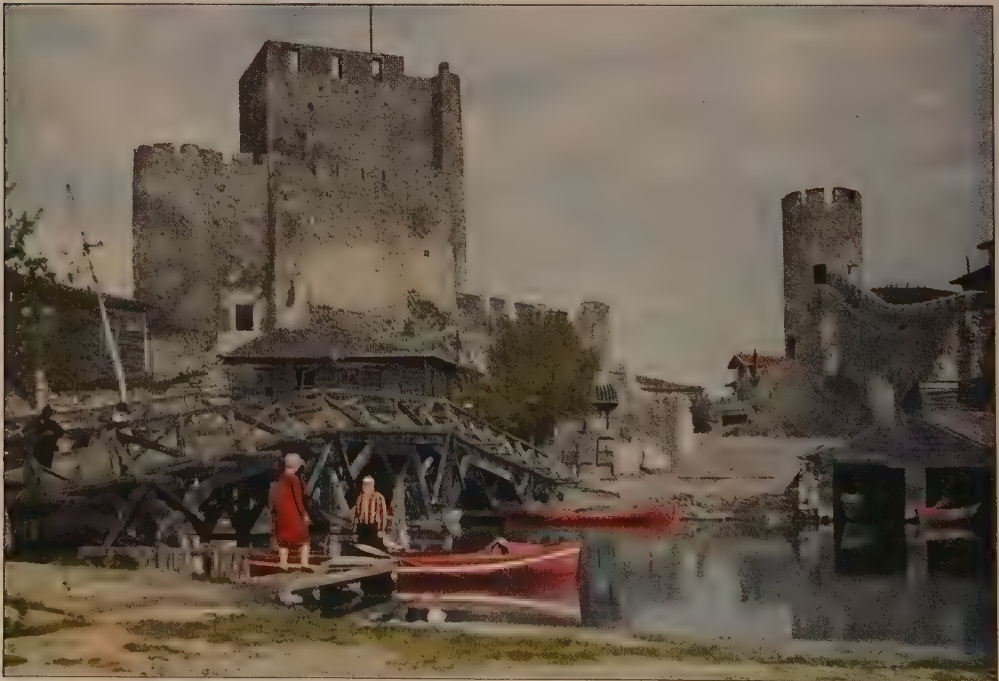
HERE THE HOSTS OF DARIUS THE GREAT CROSSED INTO EUROPE FIVE CENTURIES BEFORE THE CHRISTIAN ERA

The fortress-castle at the edge of the water is Rumeli Hissar (see also Color Plate I). According to Lamartine, the French poet, the Bosporus provides "the most marvelous point of view which the human eye can contemplate."



JUDAS-TREES ADD A PURPLE NOTE TO GREEN VALLEYS WHICH SLOPE TO THE BOSPORUS FROM THE NORTH TOWER OF RUMELI HISSAR



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AT THE FOOT OF THE "ASIATIC CASTLE" RUN THE SWEET WATERS OF ASIA

This quiet stream is no longer the rendezvous of pleasure seekers, but before the World War Constantinople's most select society frequented the spot.

SULTANS OF THE OLD RÉGIME AND THEIR COURTS OFTEN MADE RUSTIC HOLIDAY IN PICNIC GROUNDS NEAR BY

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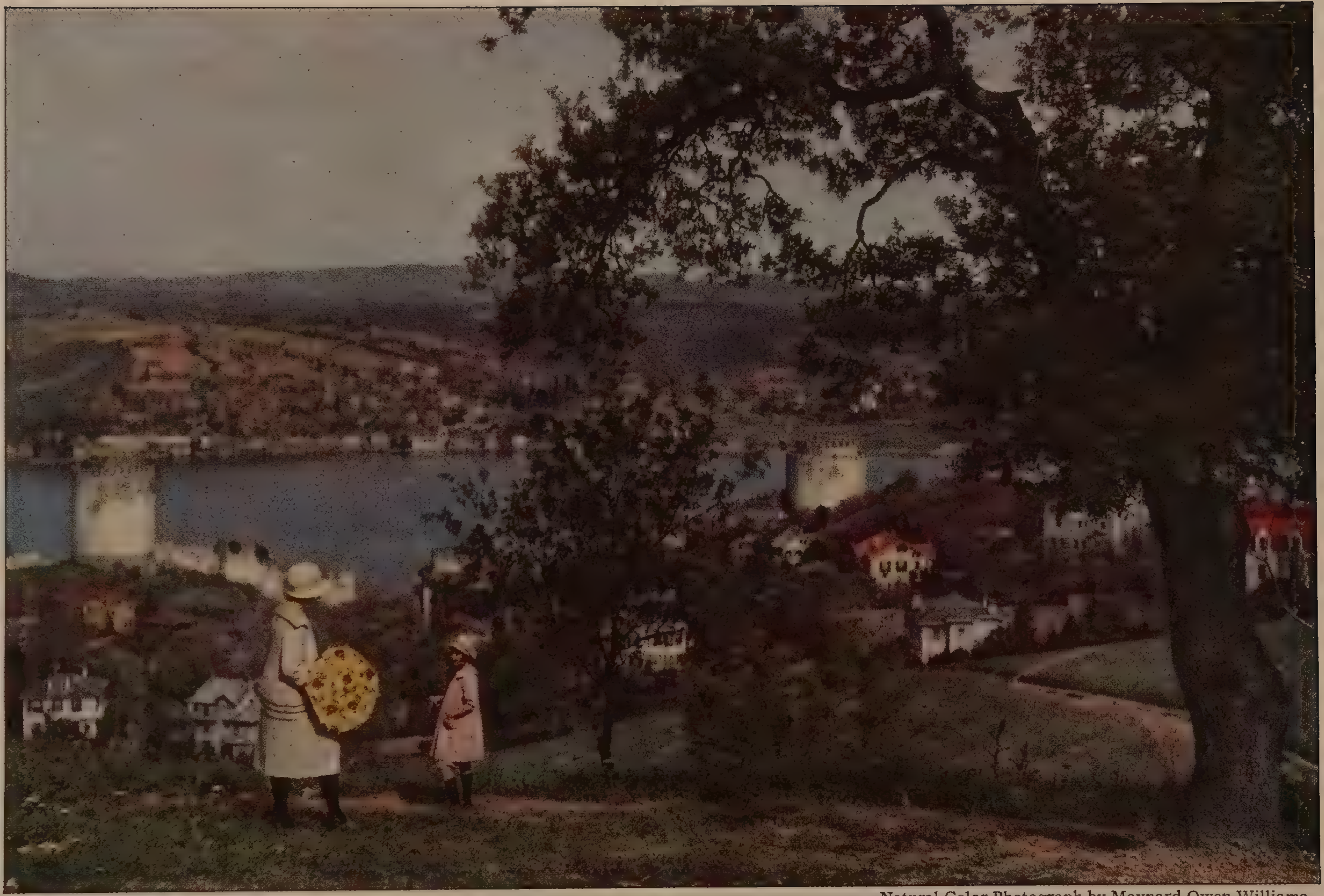
WEATHERED WOOD FRAMES THIS GARDEN ON THE BOSPORUS

Because Christians were formerly forbidden to paint their houses, natural wood is still used, a fact which in this case does not mar the beauty of the setting.



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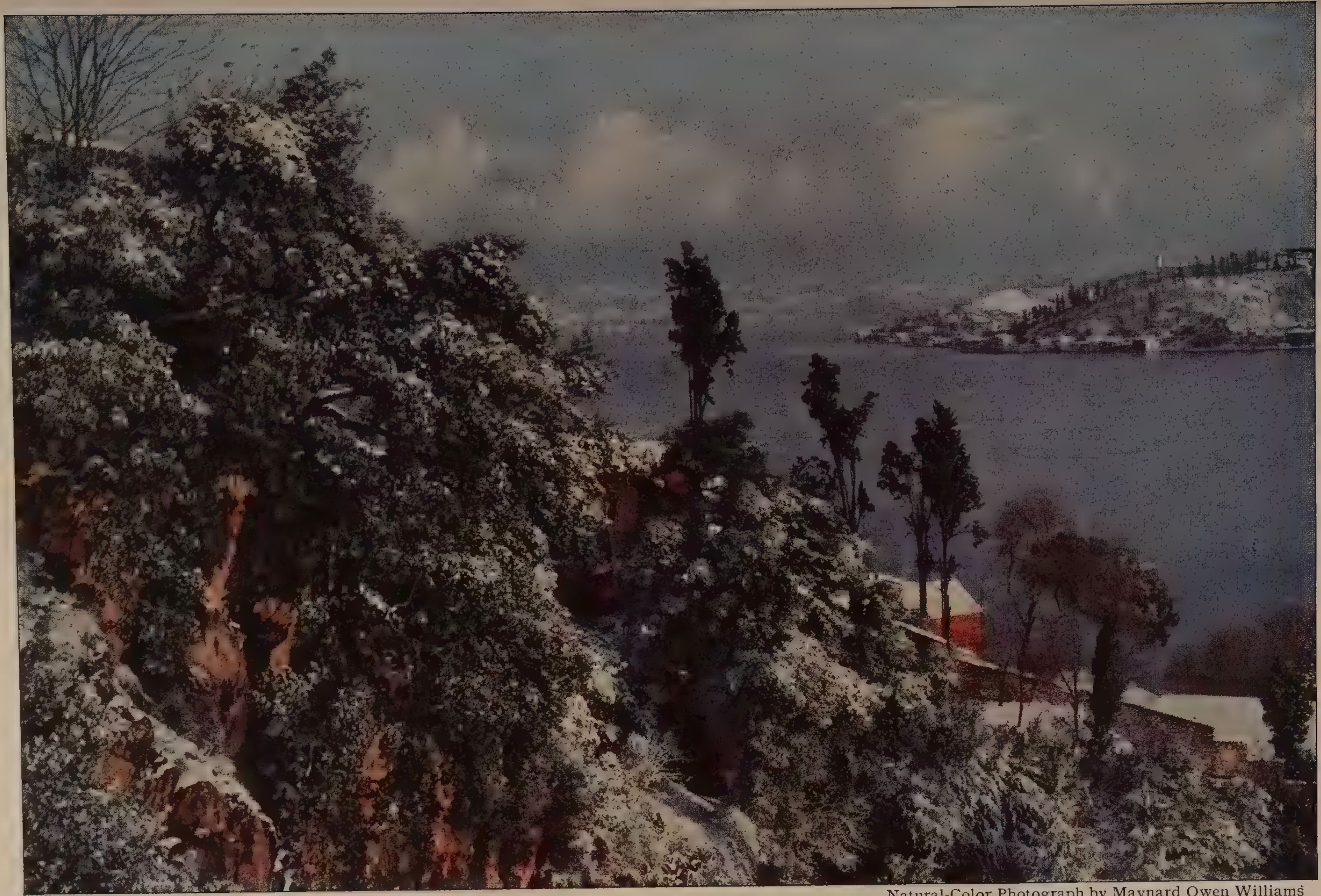
LOOKING DOWN ON RUMELI HISSAR (EUROPEAN CASTLE) AND HOMES OF ROBERT COLLEGE PROFESSORS

Here the Bosporus is narrowest and just across the water is the castle of Anatoli Hissar (Asiatic Castle), which was first built by Bayezid, 99 years before Columbus discovered America, and later enlarged and repaired by Mohammed the Conqueror. On the right of Anatoli Hissar is the little plain between the greater and lesser Sweet Waters of Asia, once the favorite picnic ground for the Turks under the Sultans (see also Color Plates IV, lower, and V, upper).



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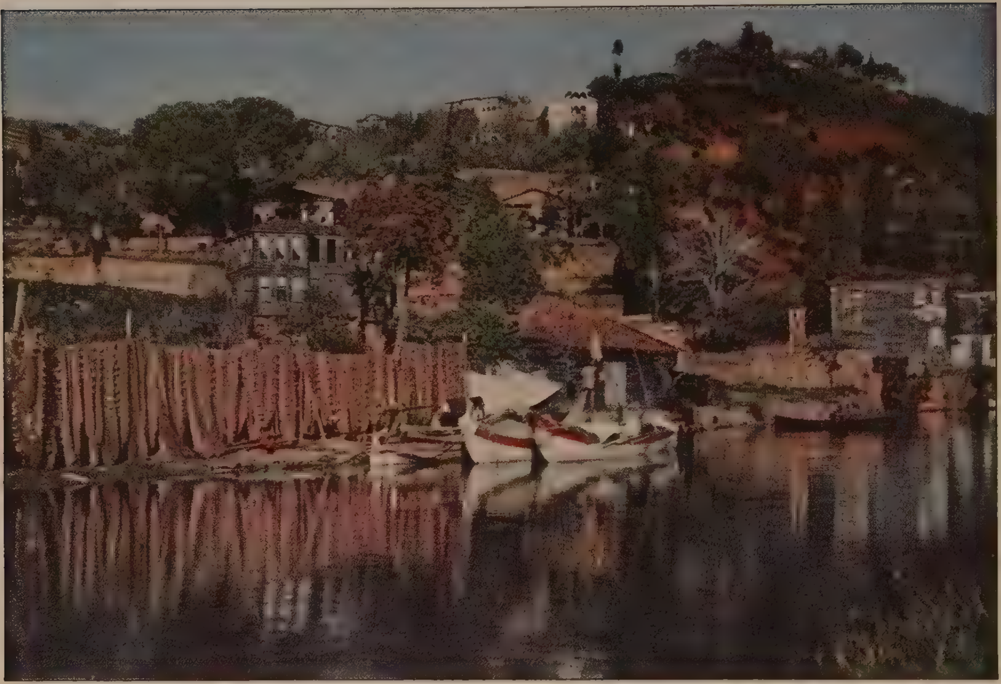
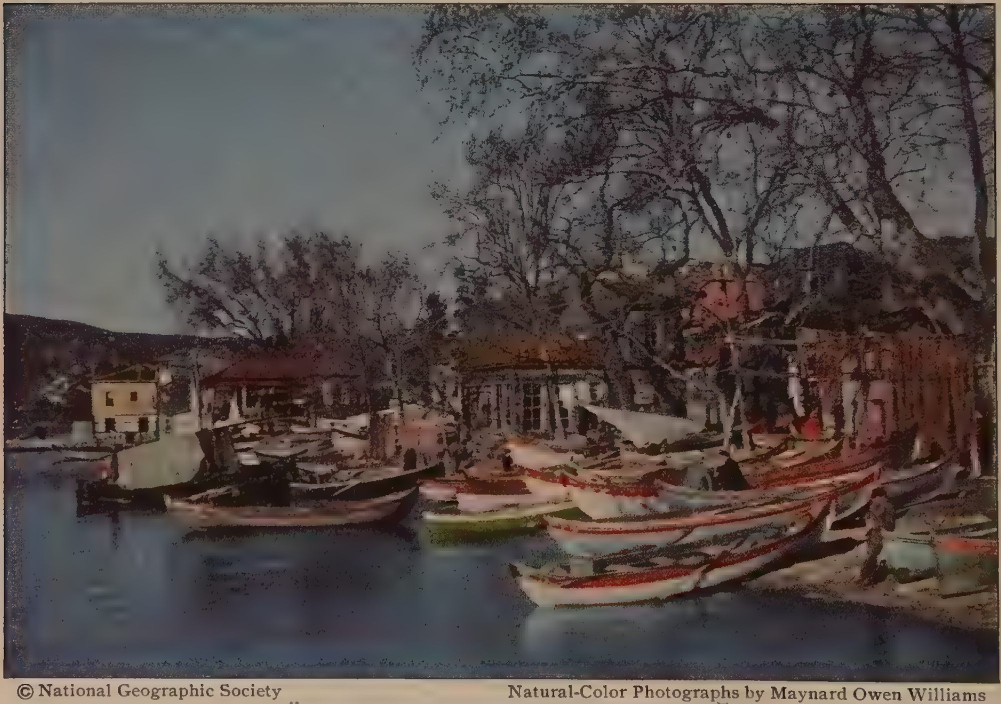
LOOKING UP THE BOSPORUS AFTER A FALL OF SNOW

The view is from a platform known as Darius's Seat, north of the north tower of Rumeli Hissar (European Castle). From this point of vantage the Eastern monarch is supposed to have watched his mighty army cross from Asia into Europe (see Color Plate III).



NETS DRYING ON BANKS ONCE GAY WITH FRIDAY HOLIDAY CROWDS

Where the decorated barges of the nobility formerly plied, the boats of market gardeners and fishers are now to be seen.



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CAÏQUES ON THE BEACH AT ANADOLUKAVAĞI

Until the recent change in Turkish place names, following the adoption of a Latin alphabet (see "Turkey Goes to School," in the National Geographic Magazine for January, 1929) this, the northernmost village on the Asiatic shore of the Bosporus, was known as Anatoli Kavak.

transfer themselves and their many bundles to small carriages drawn by diminutive horses under Russian yokes, some of them shiny with silver. After ten minutes along a splendid road, donkeys and basketmen meet the carriages and a climb begins.

Fathers take their young sons on to red plush saddles between their knees and women employ two human flying buttresses to keep them on their mounts. Your orthodox Turk sees no picnic in pedestrianism. Basketmen bring the voluminous baggage.

The proprietors of Hunkarsuyu could serve meals—and go bankrupt. Instead, they provide terraces, rush-bottomed stools, tables made of a platform, and two "horses," and scores of open fireplaces at which Turkish women, squatting on their heels, may perform miracles. Many a party, disdaining table or chair, spreads its matting and eats from a common dish as if on the open steppe.

But "civilization" is almost as portable as the utensils of the nomad, and a sign requests the patrons "not to play their graphophones while the Turkish orchestra is performing."

YOUNG TURKS ENJOY A STRENUOUS HOLIDAY

This gastronomic paradise, centered about a tiny spring, must not blind one to the fact that many young Turks pass a strenuous holiday. One of a jolly group of young men, like tourist cabiners, carrying knapsacks and athletic equipment to a deserted northwest tip of Asia, expressed his feelings:

"It's all right for you to go where the people are. But we live in the city and we want to get as far away as possible."

"What will *you* do?" I asked.

"Now we'll cross to Anatoli Kavak (Anadolukavagi) and row for a while. Then we'll all take a swim. For lunch we'll climb to the Genoese Castle, where there is a breeze and we can talk to the bearded people. (That's always interesting.) Then we tramp to Poiras Burnu and swim and play games. At evening time we'll hire a fishing boat for two dollars and sail down to Stamboul through the twilight."

At the "European Poplar," a sign on the fortress wall points to a "gasinosi" with "jazband," and Altinkum, steamer terminus, is a red-and-white striped resort where another "cazband" plays beside a gun-emplacement dance floor amid scores of bright umbrellas.

To many Turks, public bathing does not appeal. Not gregarious, they seek out secluded bits of beach near the informal dressing room of rock or shrub.

WHERE JASON AND HIS "ARGO" TURNED THE TRICK

Above the signal station at Büyük Bay the drear landscape is deserted. Tramping this rocky path, we met no urbanite on the way to the tiny beach where Karibje hides behind a dismantled fort. At Fanaraki we stood beside the marble pedestal atop the one surviving Cyanean Rock.

According to legend, if a ship ever ran the gantlet past these geologic heavyweights, the shifting rocks were to become stable. A more stable island one could not ask for now. Before the great lighthouse and fog gun were built at Fanaraki, mariners used a marble pillar on this island as the forward sight in their aim to enter the Bosporus (see page 503).

Jason and the *Argo* turned the trick. But, as with Noah's Ark, a dove was the real pathfinder. The bird flew. The islands crashed together, plucking a tail feather. On their rebound the Argonauts dashed between. On the trail of the dove I rode safely above the rock in an airplane, taking the first authorized air views.*

Men entering the Black Sea have always prayed for safety. On escaping into the Bosporus, they give thanks. On the site of the Hieron, sacred to the "twelve gods," the Byzantines built a castle. Later the Genoese captured it and gave it their arms and their name. A path along the ridge, with heavy underbrush to the east and the Bosporus a blue ribbon below, brought us to Giant's Mountain, a matchless outlook point over which the impulsive Childe Harold, concocter of brilliantly barbarous rhymes, suffered literary seasickness.

On this Moslem picnic ground one can turn back the years and study Turkish life unspoiled, as if motors and jazz bands were still unknown.

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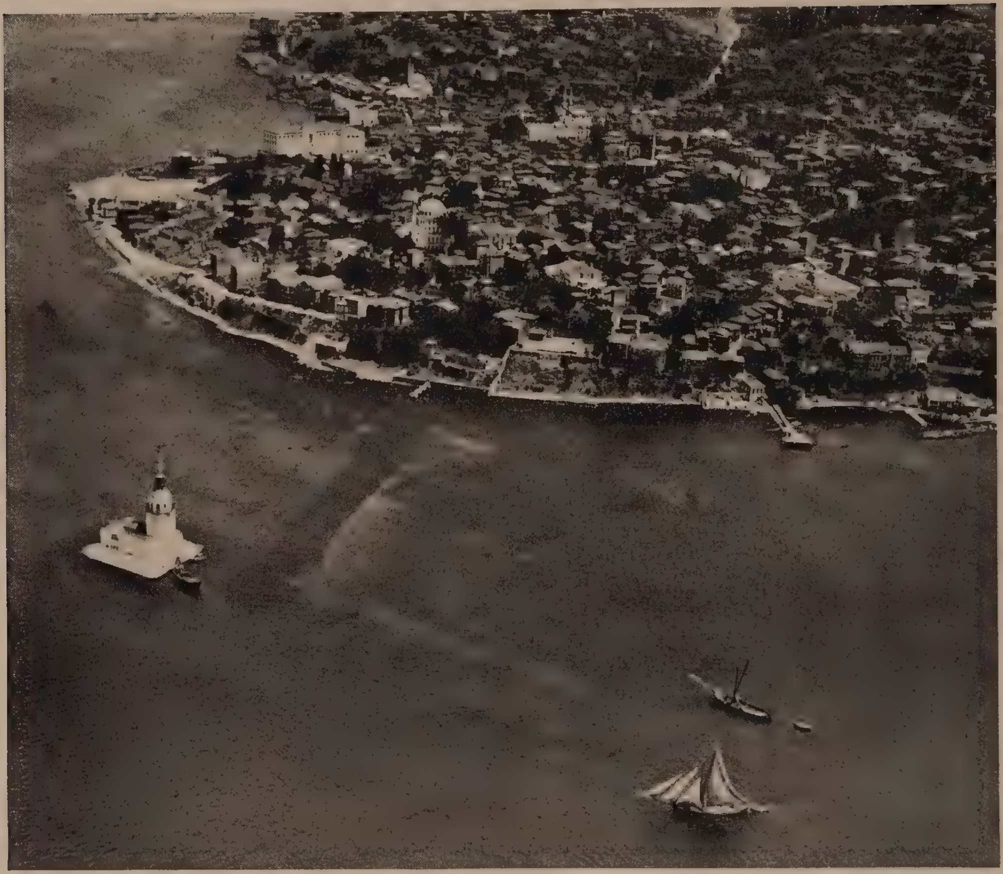
*See "Seeing 3,000 Years of History in Four Hours," by Maynard Owen Williams, in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1928.



SKUTARI IS ASIA'S FARTHEST WEST ALONG THE BOSPORUS

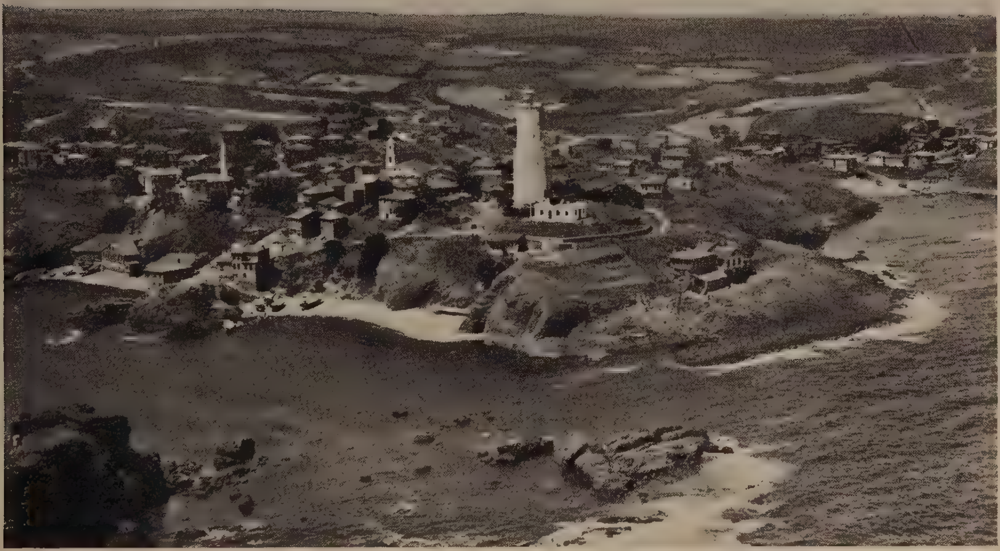
The strait is to the left and the beginning of the Sea of Marmora to the right. A short sea passage, sometimes known as the Arm of St. George, connects the two. In the middle of the Bosporus is an islet with a white, spired edifice known as Leander's Tower, or by the Ottomans as the Maiden's Tower. There is a legend that a sultan's daughter was once kept here. Skutari has recently been rechristened Üsküdar in the New Turkish.

Here the family is the social group, and Turkish love for children, for spreading trees, for fields and flowers and breezes, finds expression. There is no commercial spirit, except that an enterprising vender has lugged up from Beykoz a tray of sweet pudding, which is eaten from heart-shaped spoons.

The whole gathering has a spontaneous air. Babies, cradled in improvised hammocks, swing back and forth from sun to shade. Old ladies in white head scarfs, who have courageously climbed this hill, now sit in peace and quiet on their spotless matting. Youngsters with rubber balls play, laugh, shove and squeal, and on a score of swing-ropes, brought for the occasion, girls, boys, and grown-ups sweep far out over the steep slope, so that they seem creatures of the air. The sexes mingle in frankest comradeship and perfect propriety.

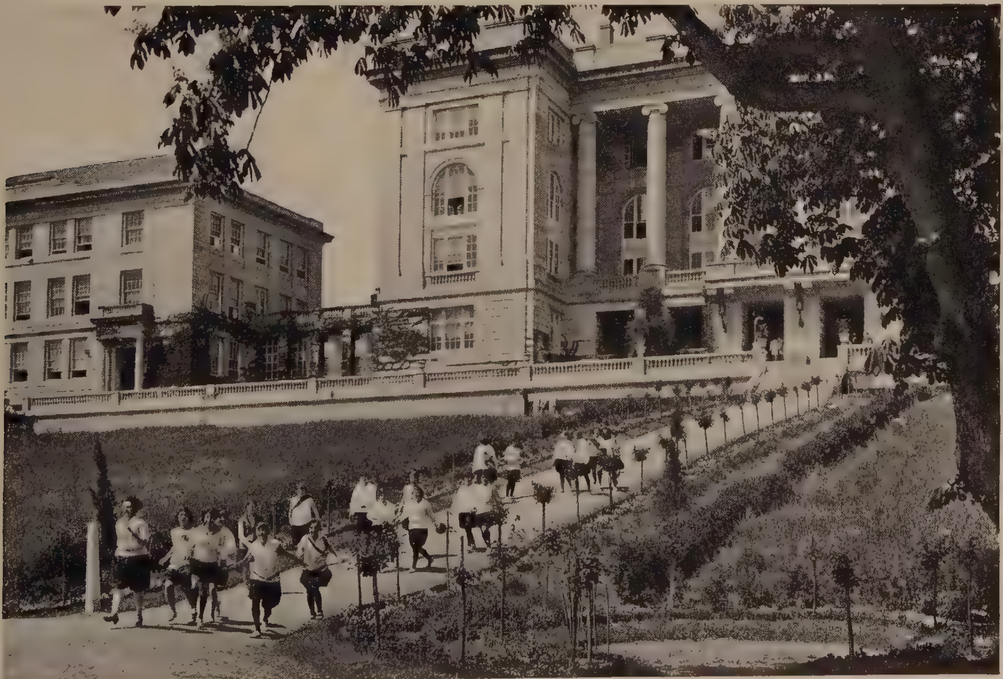
While the men were at their noon prayers, women were nursing feeble fires under pots and kettles. There are even shiny samovars. Seated on the ground in compact knots, parents and children feast quietly and abstemiously. Long cucumbers brought forth from old silk scarfs, squares of meat spitted on new-cut wands, firm, round loaves of bread, and water from the hilltop well, compose the simple meal, on which no elaborate preparation is expended.

Unaffectedness and tolerance mark the gathering. Children establish intergroup



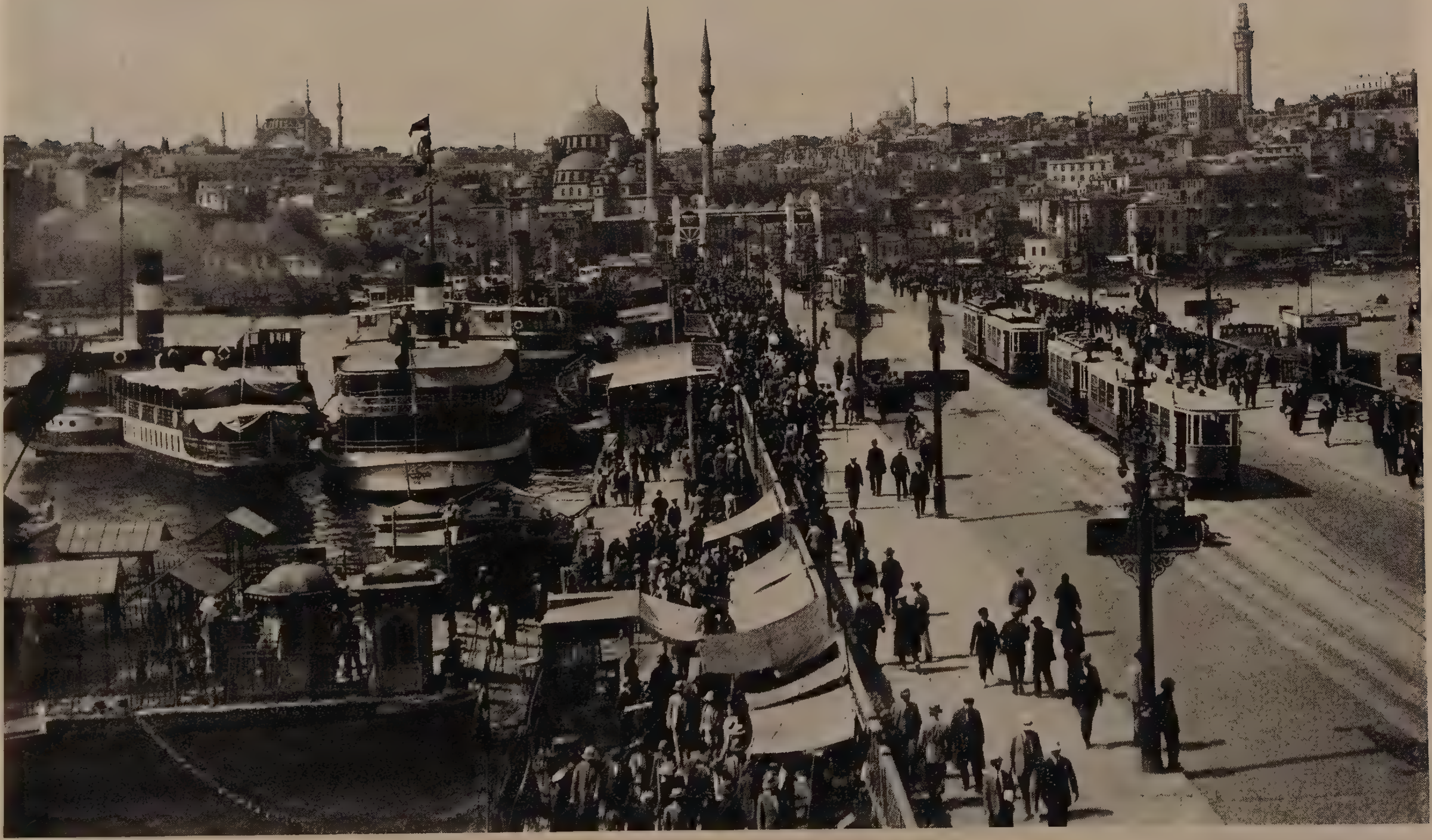
HERE JASON AND HIS ARGONAUTS HAD A CLOSE SHAVE

In the lower left corner is the one surviving Cyanean rock. Past this shifting group Jason and his *Argo* successfully ran the gantlet and it became stable (see text, page 501). On top is the white so-called "Column of Pompey." In the distance, behind the Fanaraki lighthouse, is the softly rolling landscape of the east-thrust tongue of Europe.



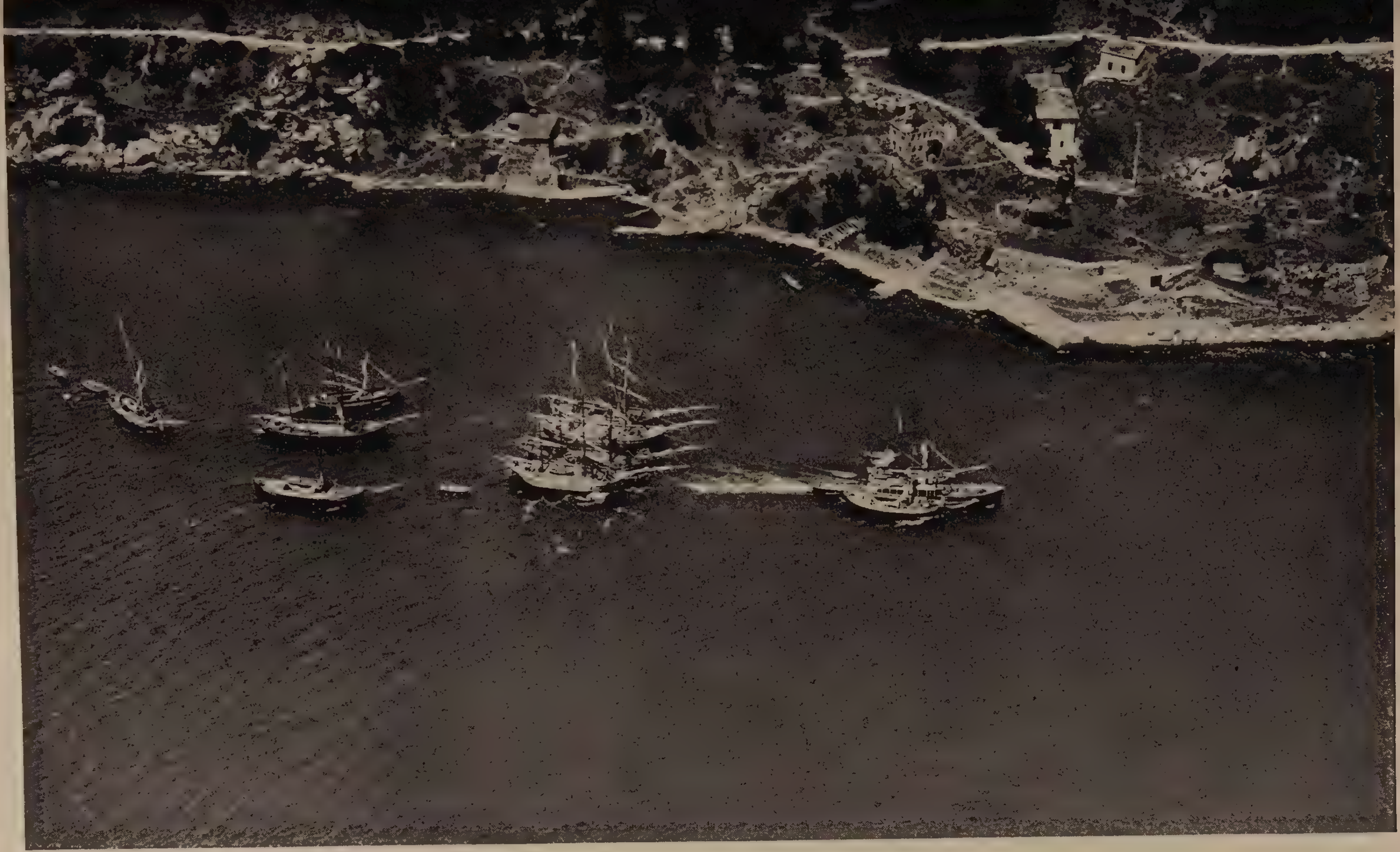
A MONUMENT OF AMERICAN PHILANTHROPY IN THE NEAR EAST

Founded in 1871 as a high school for girls, changed to a full-fledged college in 1890, the Constantinople Woman's College at Arnaut Köi is the only one of its kind for women east of Vienna (see, also, Color Plate II). Mitchell Hall, dining room and dormitory, at left; Gould Hall to the right (see text, page 489).



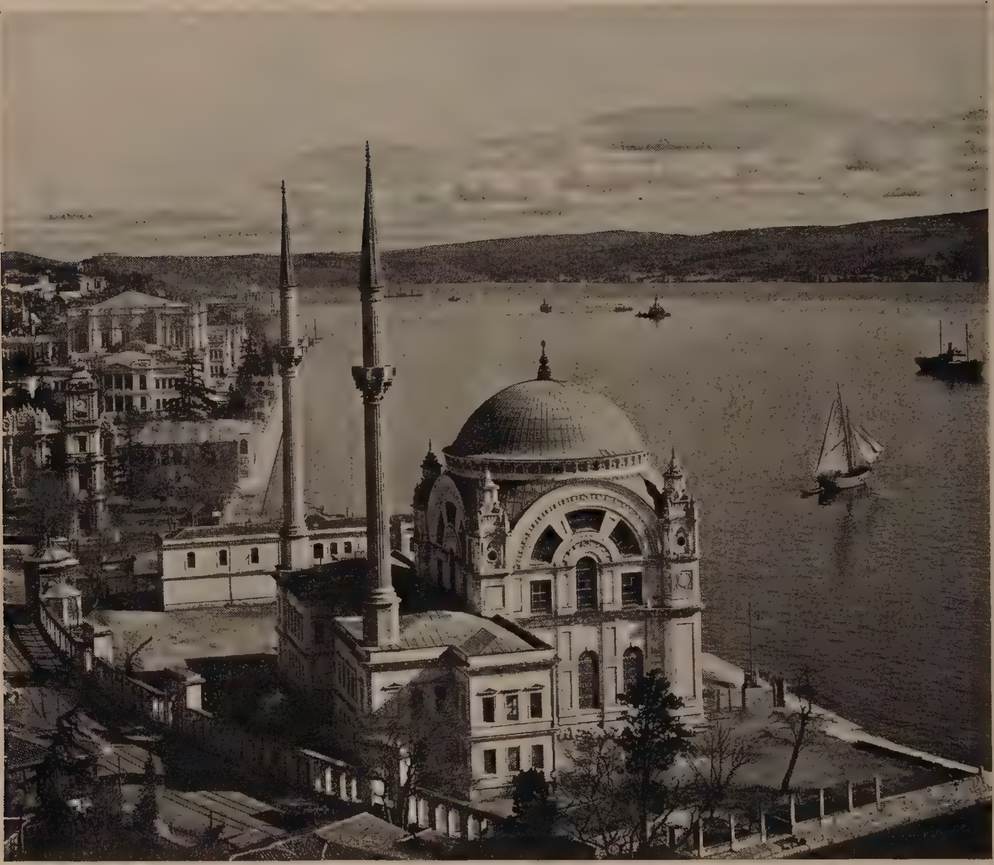
GALATA BRIDGE IS THE GRAND CENTRAL OF CONSTANTINOPLE

Here, for trippers and commuters alike, the Bosporus begins, with comfortable steamers departing seventy times a day. At the left, as one looks toward Stamboul, is the Nouri Osmanieh Mosque. At the Stamboul end of the bridge is the Yeni Valideh Djami (New Mosque of the Sultan's



ALONG THE BOSPORUS, FORT SUCCEEDS FORT

The Ottomans built the earlier ones in that proud day when, for war and battle, they looked only to themselves. French engineers planned and supervised the construction of the later ones, to which group belongs Telli Tabia, a semihexagonal stone fortress south of Rumeli Kavak, across the Bosporus from Anatoli Kavak.



THE "PALACE ZONE" OF THE BOSPORUS AFFORDS CHARMING UPSTREAM PROSPECTS

In the foreground is the Dolma Bagcheh Mosque. At the left and beyond is the Dolma Bagcheh Palace inclosure, with interminable dainty wings, lacelike carvings, and a façade on the strait more than 700 yards long Beyond it topless Cheragan Palace (see text, page 487) hides the Orta Köi Mosque in the distance. The terraced houses of Beshiktash cover the hill to the left. On the Asiatic shore, at the right, is Beylerbey Palace (see text, page 489).

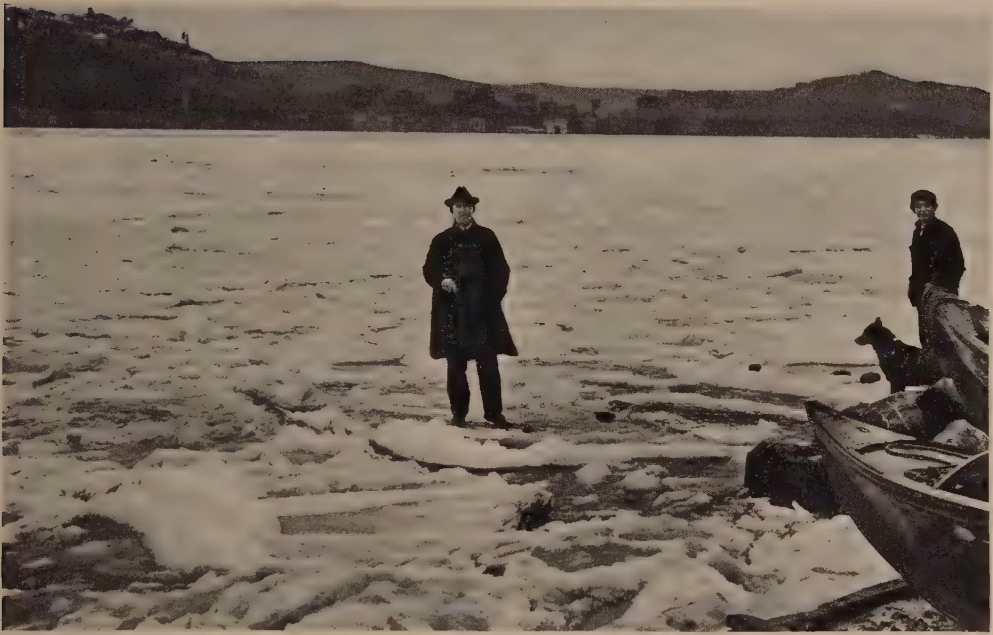
relationships as children are wont to do, but the older folks are content in small parties. Nothing is organized, nothing catered to, but this is the happiest, most natural gathering on all the Bosporus.

As we descend toward Beykoz, my wife discourses on Turkish virtues and a bald, bearded schoolmaster, sweating up the slope, has all the benignity of a Santa Claus.

Before us stretches a splendid avenue of plane trees in the midst of the secluded valley where 15,000 Russians, sent by the Tsar to prevent Mehemet Ali, of Egypt, from successfully challenging Turkish autocracy, camped on a site used long before by the Crusaders of Louis VII. Here, too, 60,000 picked soldiers of Turkey paraded before the Empress Eugénie, wife of Napoleon III and the wit and beauty of her day.

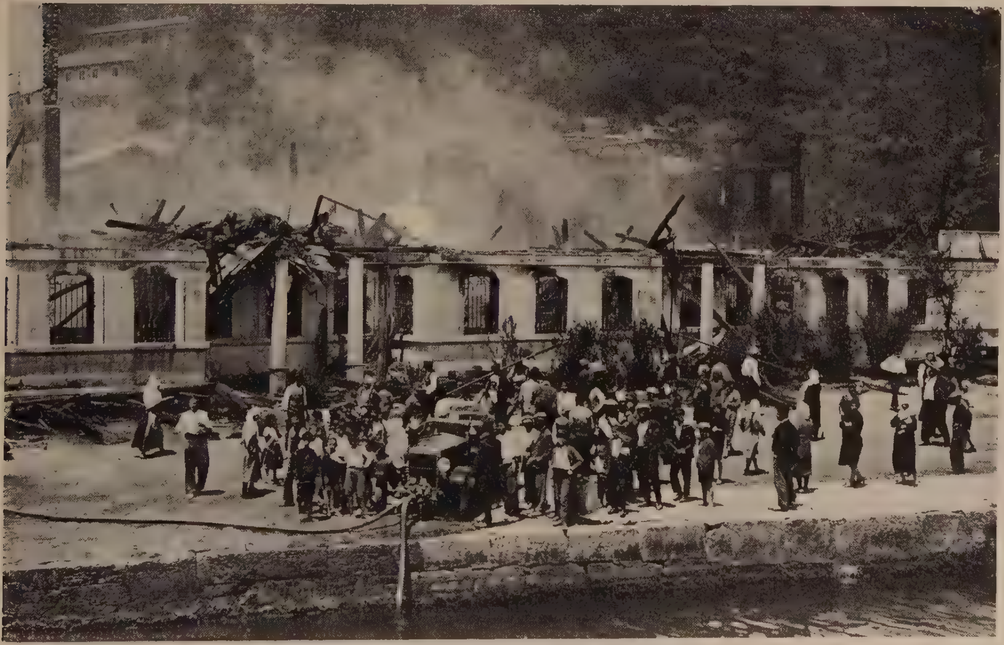
Boys on hired bicycles race around the parade ground, paced by an asthmatic motorcycle, hired out at five cents a circuit. On two football fields, a dozen balls are being kicked about. In the Bosporus, at the end of the valley, a fisherman, perched on a pole, like a stork on a nest, watches for the moment to close a fish trap.

Shoulders are burned and children told to "take their hands out of the water." There are debates as to who will row and how granny will sit so the sun won't be in the baby's face. Fat-limbed mamas, with a beam in their own eyes, admonish their 12-year-old daughters to "pull down



"JUST TO PROVE THAT I ONCE WALKED ON THE BOSPORUS"

The European staff correspondent of the NATIONAL GEOGRAPHIC MAGAZINE stands on ice that has formed over deep water below the landing stage at Rumeli Hissar. During the winter of 1928-9, the most severe in 67 years, floe ice from the Black Sea almost bridged the strait and disrupted business by confining boats to their piers. The Bosporus is rarely frozen over.



A JOKE THAT HAS LOST ITS POINT

The amusing idea of Constantinople's fire department running to a blaze with a hand pump and torchbearers must now be revised, for there are motorized units similar to this one which is restricting the fire area in a conflagration which destroyed one of the twin palaces just above the Orta Köi landing (see, also, illustration, page 490).

your skirts." At Beykoz, where a solemn company sat, daring a phonograph to be funny, forks began to beat a tattoo when "Dixie" leaped out from an American medley.

Give a Turk a chance to hear what he considers good music and he will travel far and listen long. This year, a casino at Chibukli (now Çubuklu) draws the crowds. The central decoration on each table is a dewy bottle of the local spring water. Old ladies in the black of yore have lifted their veils, revealing gold-rimmed spectacles and shrewd faces. Whitewashed latticed balconies, dotted with colorful dresses and a few furs, rise against the hill.

A musician spends half an hour tuning—or de-tuning—a piano, and the concert begins. Can any Westerner describe this quavering, nostalgic music passed back and forth from piano to zitherlike *kanoon;* divided between violin and its lap-held embryo, the *kemençe;* punctuated by the shrill pipings of the *ney* and the rattle of the *tef?*

THE SWEET WATERS OF ASIA HAVE LOST THE GLAMOUR OF THE PAST

Gen. Lew Wallace, Pierre Loti, Claude Farrère, and many another have described the charm and pageantry of the Sweet Waters of Asia. But for some reason this former playground of princes, this rendezvous of rich and poor, of daring gallant and twice-veiled lady, is no longer the vogue. Fishermen hang their dark-brown nets beside the still waters and market gardeners pile high rude barges of cabbages or beans before rowing them to Stamboul. The valley has lost none of its quiet beauty, but the glamour of the past is gone.

When the north winds sweep down from the Black Sea, adding their force to that of the Devil's Current, my boatman, ferrying me back from Asia, rows high up the backwaters of Asia until I can gaze up at the domed ceiling of a room which has been described as "the most precious thing of its kind . . . in all the world." It is the house of the Kuprili family, five of them grand viziers.

To relate how they ruled the empire of a hunt-loving sultan and captured Candia after the longest of sieges, or to discuss how European history might have been changed if their unique dynasty had not been interrupted by the viziership of Kara (Black) Mustafa, would fill a volume.

In the garden of this humble dwelling, poised above the Bosporus, a group of men sat talking near where their spotless motor boat was moored. A young man in plus-fours and checkerboard stockings, on being asked if we might enter, said "Sure!" Now a student in an American school near Paris, his English was learned in New York.

In that priceless room, for which restoration would mean ruin, a phonograph occupied one small table and a racing shell was stretched along the northern wall. The gold leaf on the ceiling hung in shreds. The graceful marble fountain was still, an eloquently muted tombstone of a vanished day.

Slanting across the Bosporus at its narrowest, we watched the massive towers of Rumeli Hissar swing against the evening sky, and I thought of the words of Dr. Edwin A. Grosvenor concerning the strait: "Whoever undertakes its delineation must be painfully self-conscious at the start that his omissions will be manifold more than all he says."

But in these days of Munchausen travel tales, verbal skill is suspect and history has crowded this canvas with exploits which no modern may match. Rather let the unimaginative but accurate lens serve until your dream ship, plowing Eurasian waters, reveals this glorious panorama while you share with holiday-making Easterners a Bosporus week-end!

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ARMISTICE DAY AND THE AMERICAN BATTLE FIELDS

By J. J. Jusserand

Formerly Ambassador of France to the United States

“CEASE firing!”

All along the immense front held by the Allied armies on November the 11th, at 11 o'clock in the morning, the bugles sounded the notes, “Cease firing,” confirming a telephonic message sent at dawn from Rethondes.

That hour, one of the most solemn in the history of mankind, was not rung from the clock of any steeple. There was no clock left at the front, no steeple.

The impression of all those present was a sort of stupor at the silence that succeeded. The roar of cannon, which, nearer or farther, had been continuously heard for years, was now hushed; clouds of smoke were no longer to be seen, poisonous gases were no more to be feared; immobility had succeeded to movement.

In the country around, silence, too. The sounds usually heard in the fields had long been hushed. No peasants were urging their oxen, no dogs were barking, no chickens cackling. In the ravaged region, there were no peasants at work, no oxen, dogs, or chickens.

The Armistice brought to an end the bloodiest war the world had ever known. The defenders of liberty, democracy, honest living among nations, had won the day.

Americans, to be sure, had not been for a long time in force at the front; but what deeds had they accomplished in those months! What invaluable help had they given at the worst period of the war, what renown gained for themselves and their country!

No one knew, before they were actually put to the test, what they would be able to achieve in such an unwonted crisis; they themselves did not know for sure. But, once resolved, they came wholeheartedly; they wanted their part to be the most brilliant possible, one that future generations would wonder at.

When asked whether they could, under a terrible fire, capture a certain ridge like the Blanc Mont, or clear a certain wood like the Bois Belleau, or cross a certain river like the Meuse, their answer was always, “We can,” and they made good.

Mr. André Chevrillon, in his *Américains à Brest,* has well described this state of mind:

“They arrived with a determined will not to allow themselves to be defeated by anyone or by anything; to show themselves, on any occasion, stronger than the antagonist, than Fortune herself. With the American, the desire is ever present to beat records—all records, his own as well as those of others—the desire to surpass himself as well as the rest of the world.”

“THE LAFAYETTES OF THE AIR”

When our training officers came to America to instruct in the use of the 75 and in trench digging, insisting on the importance of rapidity, some men, they told me, in order to be first, exerted themselves to such an extent that they fainted.

Volunteers had shown the way and made people understand what the American spirit was—a spirit in more than one

Photograph from International

AMERICA'S LARGEST TRANSPORT BRINGS A PRECIOUS CARGO INTO NEW YORK HARBOR

More than 2,000,000 troops were transported from the United States to Europe during the war. Of these, 101,217 went over on the *Leviathan* and nearly as many returned on the gigantic ship after the Armistice. The *Leviathan* is to-day in the transatlantic service.

respect not very different from the French, especially in a peculiar capacity for gaiety in the midst of danger. Death looks them in the face; they laugh at Death. Volunteers in the "Legion," volunteers in our aviation, those "Lafayettes of the air," as Mr. Roosevelt so aptly called them, and who, on the suggestion of Norman Prince, formed precisely what was called later the "Lafayette Escadrille"; young men who added to the danger for the fun of it and many of whom lost a life which they had sacrificed in advance: Victor Chapman, one of the earliest volunteers and the first to die; Rockwell; that same Norman Prince; McConnell; Genêt, who remembered his French ancestry and that he was a descendant of famous Citizen Genêt; Lufbery, who, in the intervals of his aërial exploits, was training a pair of young lions, a male and a female, to whom he had irreverently given the names of Whiskey and Soda; and a number of others who now sleep in the crypt under the noble monument erected to them by subscription near Paris (see pages 544, 545).

They would "deliberately amuse themselves by diving at the little smoke clouds" of the shots fired at them, or they would perform "an aërial fandango to bring out the enemy." Their story has been graphically told by their former chief, Major Thénault, later air attaché to my embassy, who has given an account of the prowess

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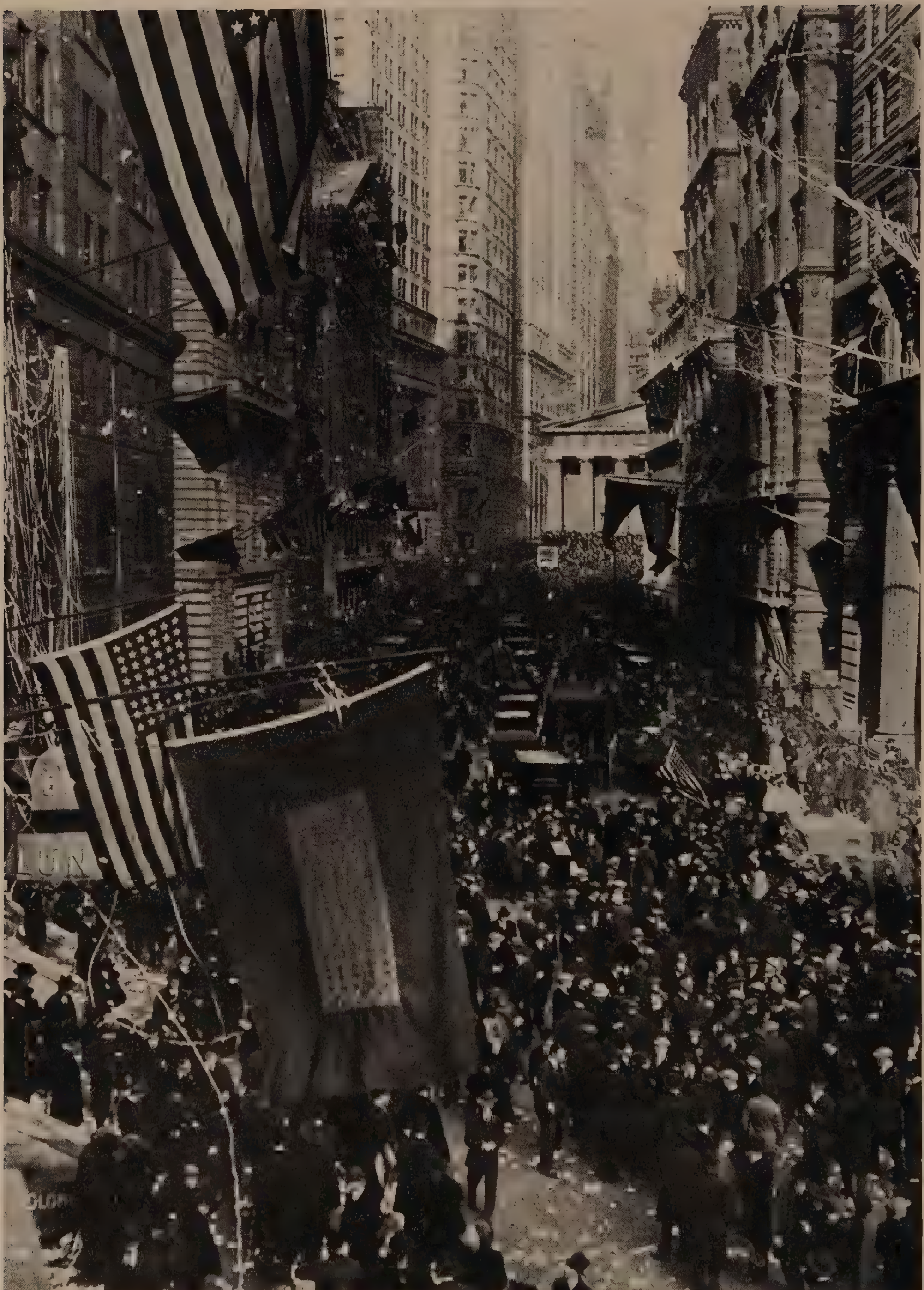
MILLING THOUSANDS ACCLAIMED SIGNING OF THE VERSAILLES TREATY

In the same magnificent surroundings where the "Grand Monarch" was wont to hold court, and where in 1870 Prince Bismarck dictated the terms which ended the Franco-Prussian War, statesmen of the victorious Allies negotiated the Treaty of Peace with Germany in 1919.

of each member of the Escadrille, with, let it be said to his credit, the sole exception of himself.

Their monument stands very impressive, with a background of old trees, and in the crypt a row of coffinlike stone tombs, all similar, with nothing but the names and dates. It was dedicated on the 4th of July, last year. The best beloved of all ambassadors, Myron T. Herrick, delivered the chief address. France was represented by the Secretary of War, Painlevé; Marshal Foch, General Gouraud, Military Governor of Paris; General Dubail, Grand Chancellor of the Legion of Honor, and, most moving of all, the survivors of the Escadrille were present, headed by their former chief, Major Thénault. A Catholic prayer opened and a Protestant one closed the ceremony, the latter by Bishop Manning, of New York.

When the ceremony was over a register was presented for the guests to sign. As Marshal Foch passed along without noticing the register, I drew his attention to it, saying, "You, of all men, should sign." He laughingly answered, "And not knowing how to sign, made a cross." "Make it, by all means," I could not help retorting, "and it will be a cross of honor."



Photograph from International

EVEN THE HEART OF COMMERCE SKIPPED A BEAT ON ARMISTICE DAY, 1918

Crowds in the canyons of Broad and Wall streets, lower New York, forgot finance and joined with the rest of the world in celebrating the termination of the war. Miles of ticker tape were flung out in streamers, like strips of crêpe paper at the New Year.

Photograph by U. S. Army Signal Corps

A PARISIAN CROWD CELEBRATES THE ARMISTICE

When the news became generally known that the agony of war at last was ended, the victory-mad crowd went wild with joy.

He, too, now lies in a crypt at the Invalides, beside another savior of France, Turenne.

THE SPIRIT OF YOUTHFUL AMERICA IN FRANCE

But now all America was following suit; her sons, coming in immense numbers from all parts of the country, young men of most varied origins (the American censor had to read letters written in fifty different languages), were imbued with the same spirit. Owen Wister has described, as he knows how, a landing of them at Brest:

"Upon this medieval mass emerges and pours the vigorous, raw, gay New World. It rises from the ocean like an apparition. Every atom of it expresses youth. It flows down the transports and enters the town. It pervades Brest. Youth radiant, youth perpetually clean-shaven, youth of a strange countenance and build, surging up from the horizon out of the west—soldiers, sailors, marines, engineers, mechanicians, constructors, organizers—wearing a garb and speaking a tongue from beyond the sea."

In spite of that strange tongue and of ours, which seemed as strange to them, they soon found themselves at home in the distant land of France. They were good fellows and met good fellows. They were astonished at nothing. Instead of blaming, swearing, giving up in the case of mishaps or mistakes, they devised means out of the difficulty.

This disposition they had inherited from their forefathers, the pioneers of old, who, too, astonished at nothing, disheartened by no obstacle, persisting in spite of failures, transformed wild, unkempt, useless, savage-ridden America, that "untamed continent," said Parkman, into a country of progress and beauty, of immense manufactures and immense gardens, of thought, of freedom, of bold experiments and discoveries. Those who had not this disposition by inheritance had caught it by contagion.

They were merry, ingenious, and kindly.

© Underwood and Underwood

THE FORMER FRENCH AMBASSADOR AND MME. JUSSERAND

For 22 years this gracious couple were known and beloved in the capital city of the United States. When Monsieur Jusserand relinquished his post in 1924, he was dean of the diplomatic corps and he and Madame had won for themselves a warm place in the hearts of the citizens of Washington.

When the peasant family upon whom they were billeted, in the regions where there were still peasants left, happened to be in trouble, they exerted themselves to remove the trouble, though it was not theirs.

This inclination to make themselves useful, whatever be the circumstances, was that of their whole nation, of their women as well as their men, of the members of those volunteer ambulances early organized at the French front by a typical American, former Assistant Secretary of the Treasury, A. Piatt Andrew, whose helpers, bent on saving other people's lives, paid so little attention to their own that they counted proportionately as many dead as the fighting regiments.

FRANCE REMEMBERS THE GENEROSITY OF AMERICAN WOMEN

The same with the innumerable works founded and sustained by women, like the American Fund for French Wounded; the aid for devastated France of Miss Morgan and Mrs. Dike; the help supplied by the Daughters of the American Revolution, who adopted more than three thousand orphans and gave a water supply system to Tilloloy; by the American Red Cross, the Y. M. C. A. and Y. W. C. A.; by Mrs. Crocker, who rebuilt Vitrimont; by Miss Belle Skinner, the good fairy of Hattonchâtel, and many others gratefully remembered, so numerous that a list of them would fill pages.

"The courage of her soldiers," said General Gouraud in one of his addresses, "is not the only help which has come to us from America. She has given us also the devotion and generosity of her women."

Such displays of character and, more than all, American cheeriness went to the French people's heart. General Berdoulat, of our army, told me that during the severe fights around Château-Thierry he had with him American troops ably commanded by General Bowley. He felt one day that they must, after hard fighting, be exhausted and he phoned to the general: "In the course of the afternoon, you will rest and be relieved."

General Bowley phoned back: "Impossible! A question of probity. I have here a quantity of German shells; I must return them to their owners." "One," continued General Berdoulat, "who in the midst of a hard battle can make such an answer is not merely a comrade in arms, but a friend, a brother, to love till you die."

I was once telling this anecdote in the presence of the architect of the Woolworth Building and many other famous monuments, Mr. Cass Gilbert, who said: "I know something of this. The American contingent had captured an enemy battery with its ammunition, and it was my son, serving then as an artillery officer, who was entrusted with the care of supervising the return of the shells to their owners."

In our military training schools, again, where some went to study; in our universities, where a number of them followed courses, I have it from the rectors of several such universities, young Americans endeared themselves to their French comrades by those same appreciated qualities of good will, good fellowship, and cheeriness.

Photograph by P. & A., courtesy American Legion Monthly

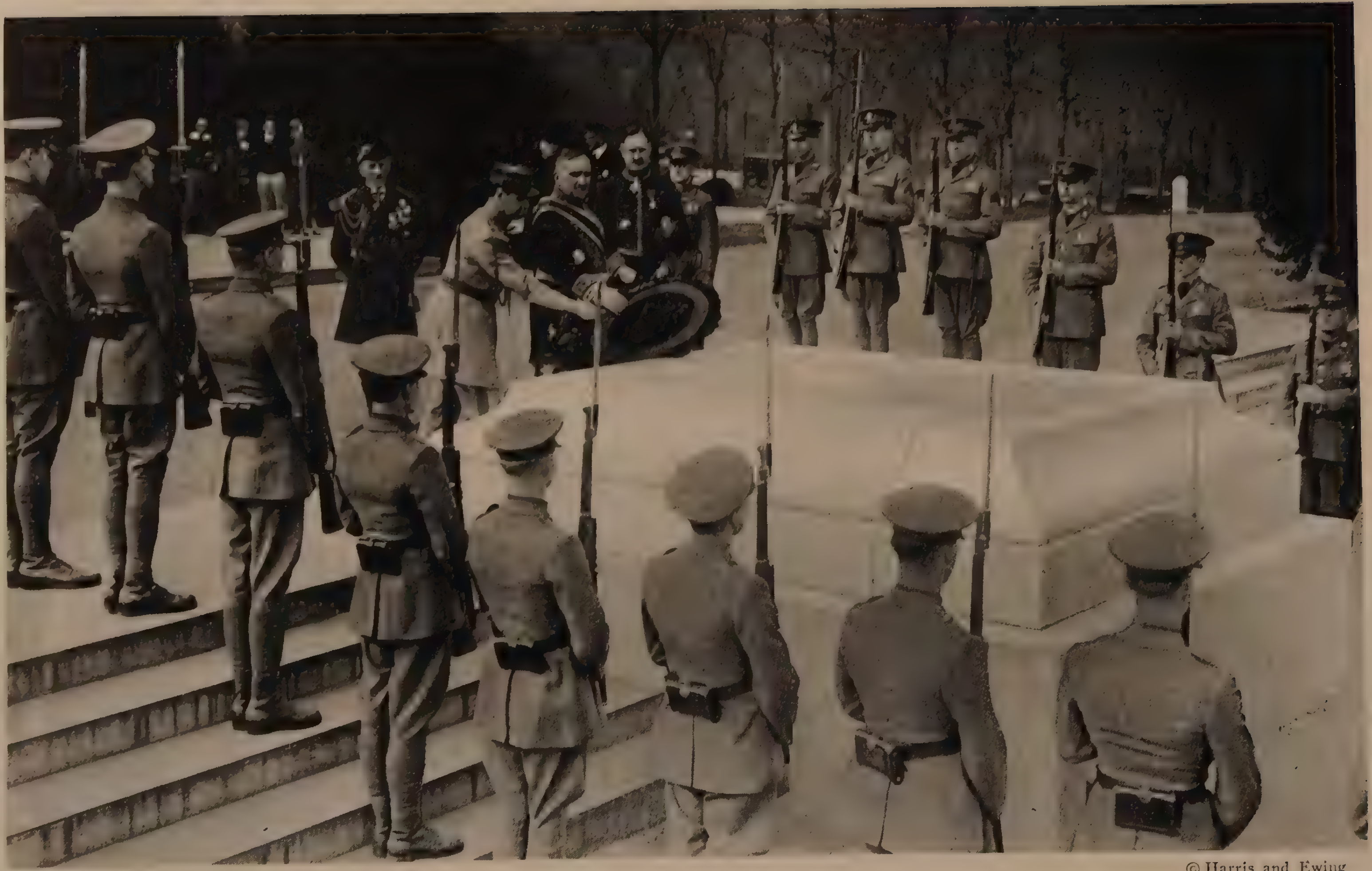
DISCIPLES OF FRANCO-AMERICAN GOOD WILL

Marshal Ferdinand Foch, Generalissimo of the Allied Armies (left), and Ambassador Myron T. Herrick, long the beloved envoy of the United States to France. Both of these great men have recently passed forever from the stage of human affairs, but the influence they wielded will long be felt.

NATURE HELPS MAN HEAL WAR'S WOUNDS ON THE FIELDS OF FRANCE

The deeds, done with a spirit without which Foch's tactics would have been impossible, will ever be remembered in France, whose fields will long bear marks of the terrible contest fought out there.

Man has since pluckily done his work, leveling trenches, removing obstacles, rebuilding houses, sowing fields; and Nature, with her hatred of death and ugliness, has grown plants and wild flowers, and has wreathed with her smiles places where human beings had fallen by the thousands, bathed in blood. Mr. Gervais Courtellemont's autochromes give an idea of what the land now looks like, and show how, in the midst of those flowers and smiles, one comes suddenly upon grim reminders of the great fight—wire entanglements slowly rusting *in situ,* houses with



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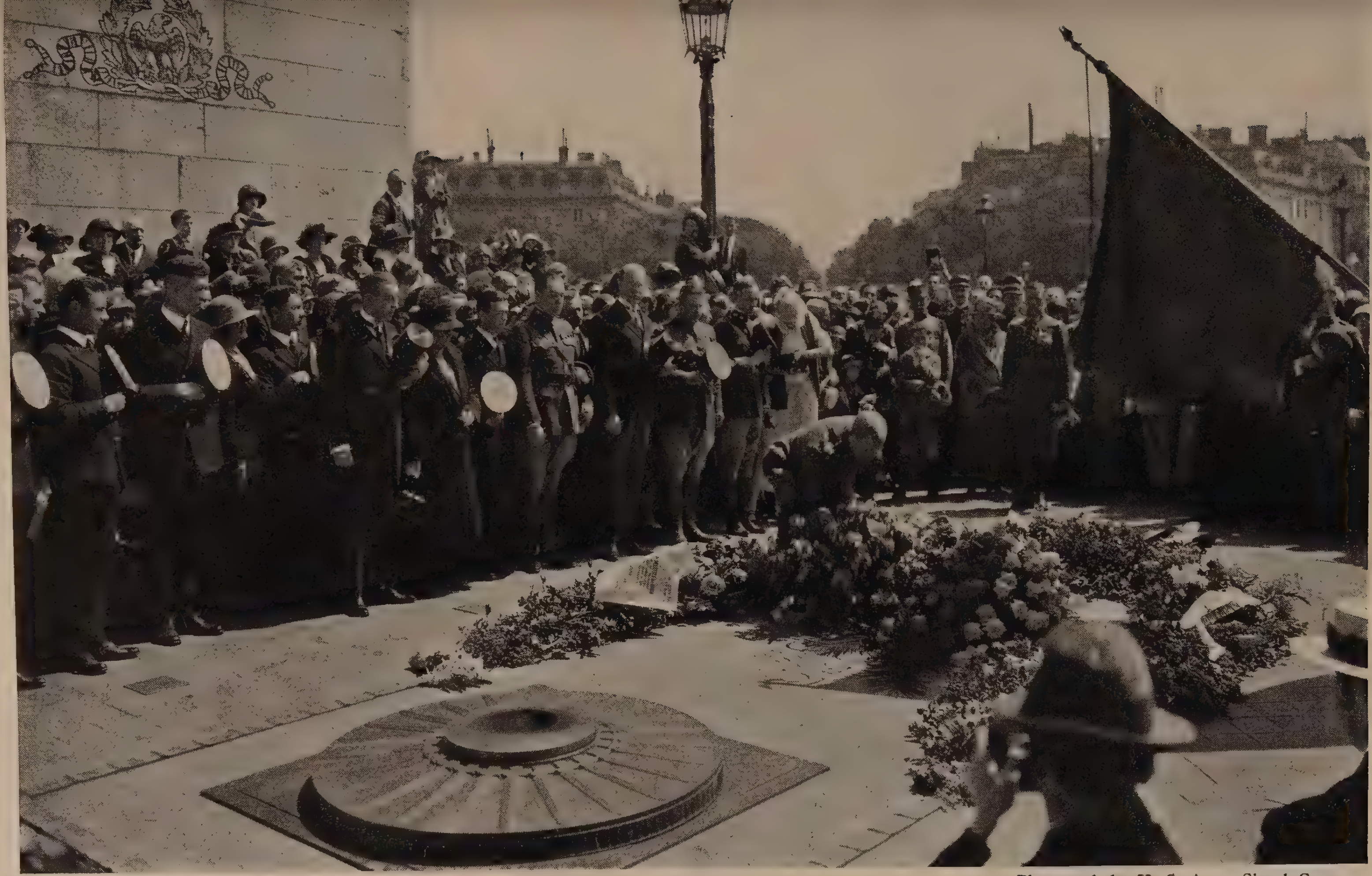
FRANCE PAYS HOMAGE TO AMERICA'S UNKNOWN SOLDIER

Ambassador Claudel, for the French people, is shown here laying a wreath on the tomb of the warrior dead in Arlington National Cemetery. It seems a fitting tribute to those who gave their lives that each of the Allied powers has dedicated a similar shrine.



Photograph by U. S. Army Signal Corps

NO SPOT IN FRANCE IS MORE REVERED THAN THE TOMB OF HER UNKNOWN SOLDIER

General Pershing is seen here placing a wreath on the grave beneath the Arc de Triomphe. The eternal flame in the circular brazier to the left of the flowers burns like the unquenchable spirit of the warrior dead.

Photograph by Ewing Galloway

BENEATH THE ARC DE TRIOMPHE LIES THE UNKNOWN SOLDIER OF FRANCE

No more fitting place could be found for the warrior's tomb than the Place de l'Étoile, where rears the magnificent monument to the glory of the country for which he died.

their gaping wounds still open, dugouts untouched, guns left where they were, in fields or forests, amid the crops or under the leaves of renascent Belleau Wood.

Such sights may be seen, for instance, at Cantigny, where the First American Division achieved glory (and the inhabitants now enjoy a restored water system, gift of the National Geographic Society*); at Château-Thierry and Bois Belleau (June 4, 1918), where the famous Marines surpassed themselves, adding those names to the proud, joyous song which, standing by the side of their chief, General Lejeune, I once heard them sing:

From the Halls of Montezuma
To the shores of Tripoli,
We fight our country's battles
On the land as on the sea. . . .

As we raised our flag at Tripoli
And again at Mexico,
So we took Château-Thierry
And the forest of Belleau. . . .

Here's health to you and to our Corps,
Which we are proud to serve;
In many a strife we've fought for life
And never lost our nerve.
If the Army and the Navy
Ever look on heaven's scenes,
They will find the streets are guarded by
United States Marines.

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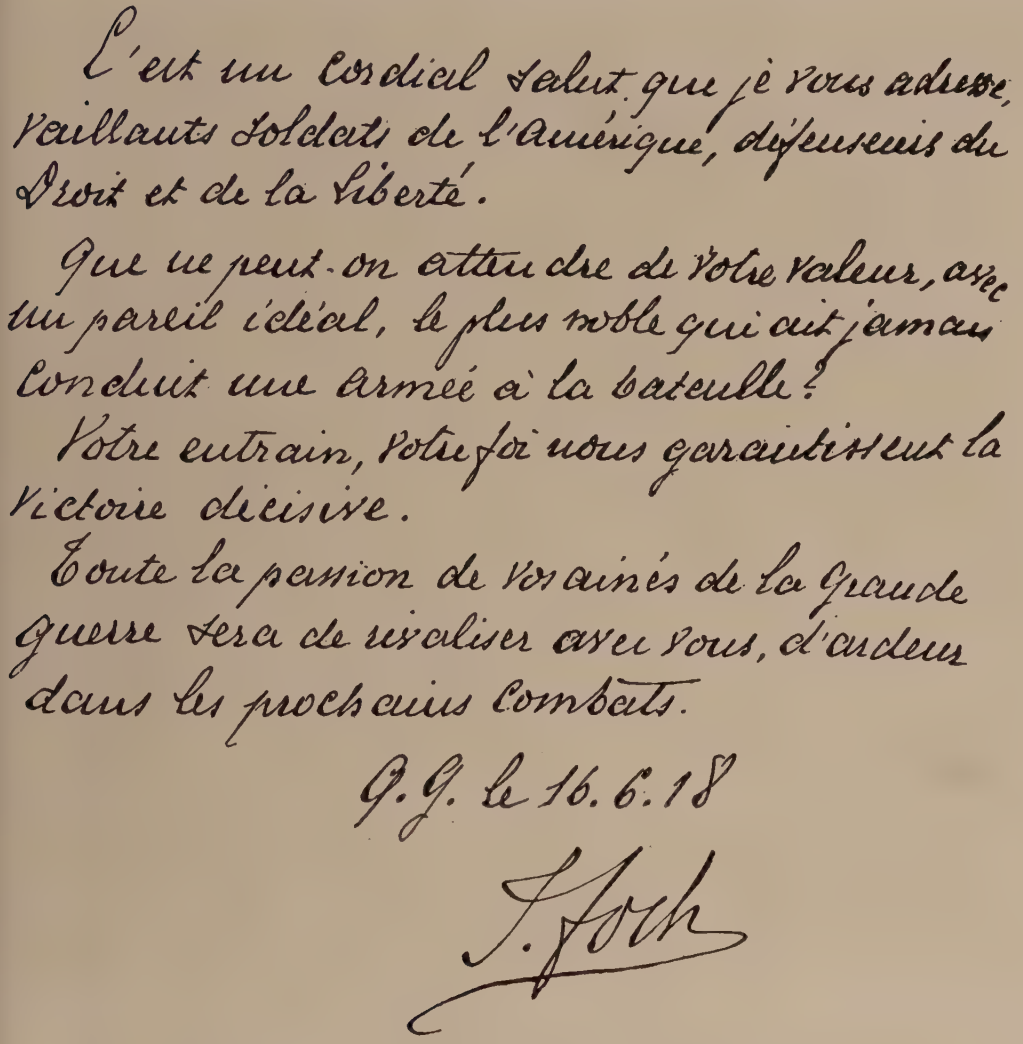
* See "The National Geographic Society's Memorial to American Troops," in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1923.



C'est un cordial salut que je vous adresse, Vaillants Soldats de l'Amérique, défenseurs du Droit et de la Liberté.

Que ne peut-on attendre de votre valeur, avec un pareil idéal, le plus noble qui ait jamais conduit une armée à la bataille?

Votre entrain, votre foi nous garantissent la victoire décisive.

Toute la passion de vos aînés de la Grande guerre sera de rivaliser avec vous, d'ardeur dans les prochains combats.

Q.G. le 16.6.18

F. Foch

THE ALLIED COMMANDER'S MESSAGE TO THE A. E. F.

"The greeting that I send you is a cordial one, valiant soldiers of America, defenders of right and liberty. What cannot one expect of your valor with such an ideal, the noblest that ever led an army into battle? Your spirit, your devotion, guarantees for us a decisive victory. All the passion of your seniors in the great war will be to strive to emulate your ardor in the approaching combats."

Then came, in July, for the "Rainbow Division," the battle in Champagne, under General Gouraud; then, in September, the capture by an army of about 660,000 men (550,000 Americans and 110,000 French), under the command and leadership of General Pershing, of Saint-Mihiel, in the hands of the enemy since the beginning of the war; where Generals Pershing and Pétain entered, side by side, on the 13th of that month.

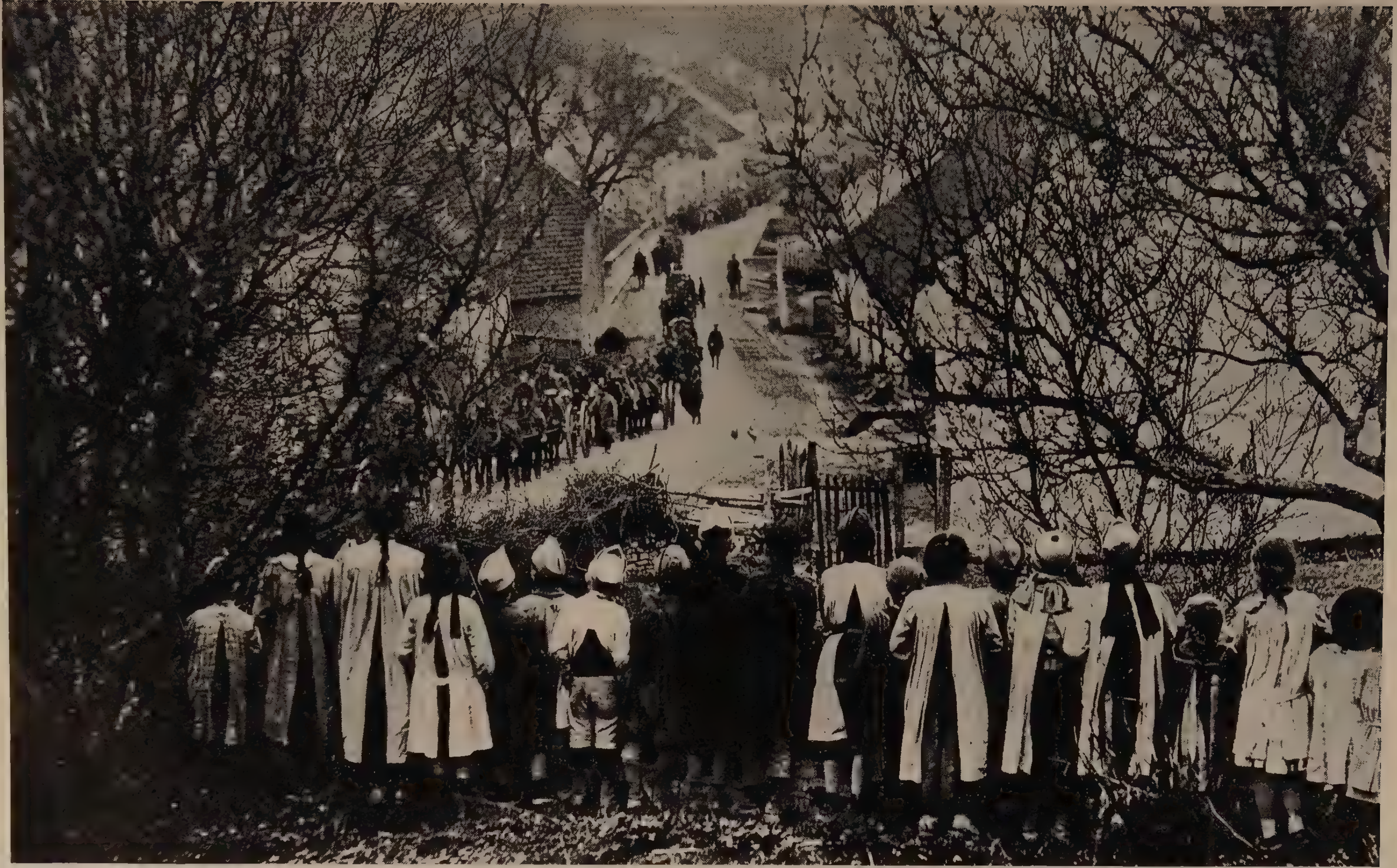
The American Secretary of War, Mr. Newton D. Baker, was also present and noticed a ruined house, duly pillaged and emptied of all furniture, with a solitary engraving still hanging on one of its crumbling walls. The gentleman happening to nod to him from his frame in this devastated place was "Le Général Lafayette."

Lastly, the great Meuse-Argonne offensive, which was, on the 5th of November, to carry the American troops to the right bank of the Meuse and to end in the final victory.

Photograph from Press Illustrating Service

PARIS GREETED WOODROW WILSON AS THE MAN OF THE HOUR

United States ever met with such a stirring reception as that accorded the war-time President by cheering



Photograph by U. S. Army Signal Corps

THE YOUNGER GENERATION OF FRANCE REVIEWS ADVANCING YANKEE SOLDIERS

Many cemeteries, kept in perfect order, under careful American supervision—at Romagne-sous-Montfaucon, at Thiaucourt, Suresnes, and several other places—and a number of monuments, now to the American, now to the French Army, now to both — sometimes grandiose, sometimes naïvely modest, like the one shown in Mr. Courtellemont's Plate XIII—are also reminders of the past.

MARSHAL FOCH DEDICATES MEMORIAL

The fine one at Flirey, erected by the French to commemorate the "jump off" of the Americans in that great offensive of theirs which resulted in the capture of Saint-Mihiel, was dedicated in August, 1921, by Marshal Foch, in the presence of a delegation of the American Legion.

The village by the side of which it now stands consisted of such a confused heap of ruins that its parish priest, an old man, white-haired, ruddy-cheeked, with a worn *soutane* turning to green, told us the intention was to rebuild it, not on its old site, but a little beyond, what was left of its houses being rather a hindrance than a help.

As touching as any are a few scattered tombs, like that of Quentin Roosevelt at the place where he fell, or that of the first three Americans who died fighting in the great conflict. A monument, on which appears the double cross and the thistle of Lorraine, was raised to them near Bathelémont, during the war, by a subscription in which all the villages of the Department of Meurthe-et-Moselle took part. The inscription reads (I translate):

"Here, in Lorraine ground, rest the first three American soldiers killed at the front, November 3, 1917: Corporal J. M. Gresham of Evansville, Private Thomas Enright of Pittsburgh, Private Merle D. Hay of Glidden. Worthy sons of their great and noble nation, they fought for right, for liberty, for civilization, against German imperialism, the bane of mankind. They fell on the field of honor."

A reduction in ceramics of this tomb was made at Nancy, and it was my privilege to present one to each of the three mothers.

As for us, the number of our dead has been so considerable that it has proved impossible to secure for each a separate resting place, and they lie, unknown soldiers, by the tens of thousands or hundreds of thousands, in ossuaries, as at Douaumont, Dormans, Notre-Dame-de-Lorette, Hartmannsweilerkopf, la Ferme Navarin; and ceaseless new finds make it necessary to remodel and increase the size of those repositories.

Just now a movement has been started, under the leadership of Marshal Lyautey, for private contributions to help toward those indispensable increases. In a common grave lies, with over a hundred of his companions, the only son of Marshal Foch, killed in the first month of the war.

Asked later whether he desired that the body be removed for separate burial, the Marshal refused, saying that he had rather his son should remain with his comrades; and he never failed, each year, on the anniversary of the young lieutenant's death, to make a pilgrimage to the spot and, thinking of them all, to kneel in prayer.

Scarcely less moving is the sight of those empty spaces where Nature has not neglected to play her part and to grow wild flowers, where prosperous villages once stood and where nothing remains, indeed, but wild flowers.

Some twenty of these villages have fared even worse than Flirey and are counted among the war dead; their inhabitants, killed or scattered, have vanished; there are none left to bring back life to those desolate places. Their names had to be struck from the list of French communes.

HOLDING THEIR TRENCH TILL THE END OF TIME

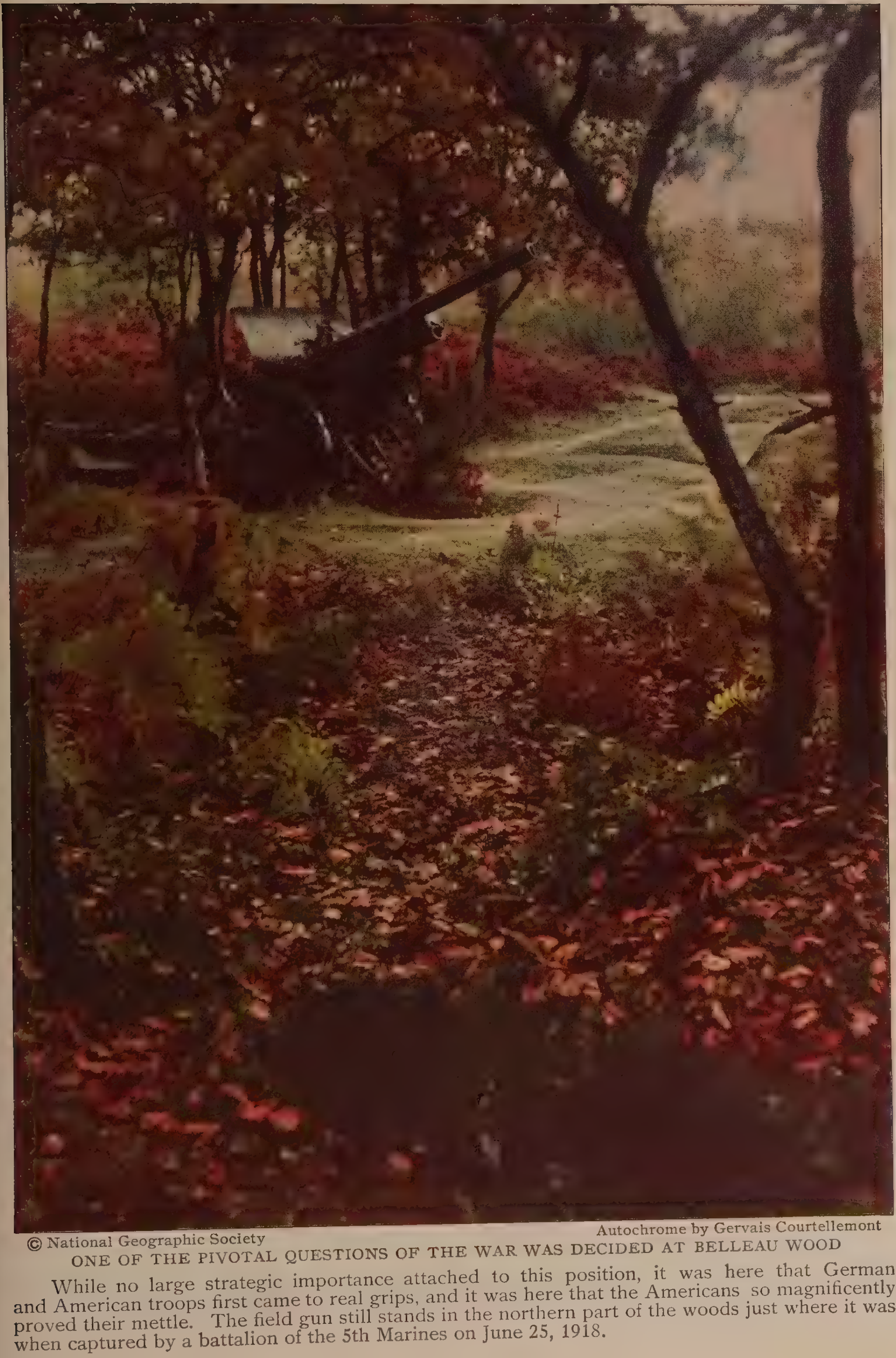
Shortly after the Armistice, as we were returning from the fort of Vaux, to which we had been guided by General Valentin, then in command at Verdun, we stopped at some distance, on a denuded plateau, nothing rising above the level ground—not a tree or the stump of a tree, not a shed, not a stone—nothing.

"Here," said the General, "you are in the midst of the village of Fleury."

"This is indeed," my wife answered, "sacred ground."

The General replied, "I shall show you, Madame, truly sacred ground."

Leading the way among the shell holes, full of marshy water, many overlapping



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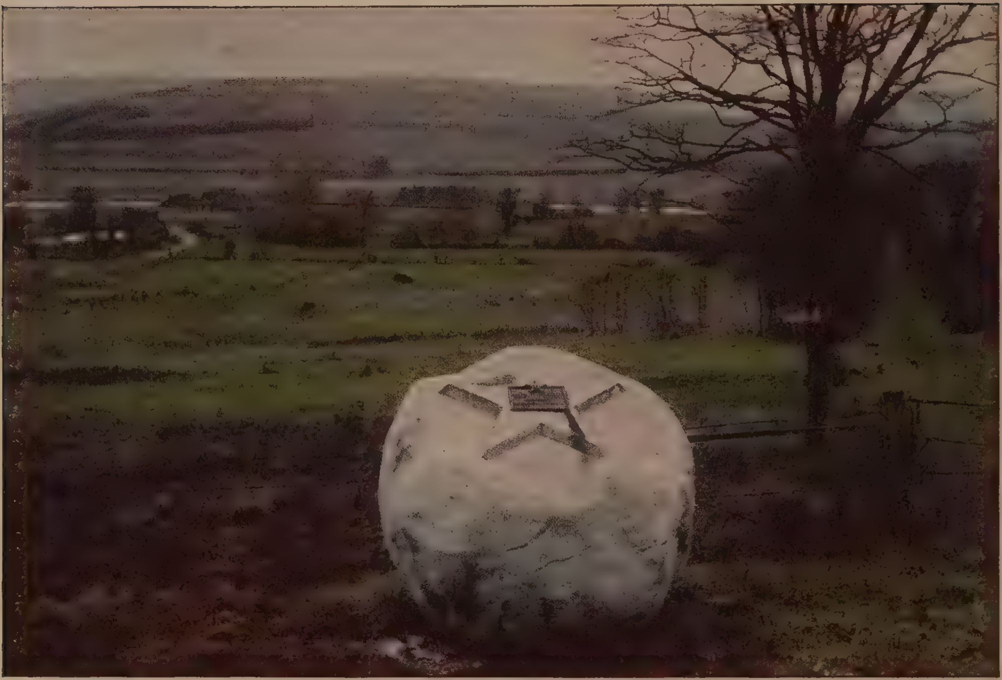
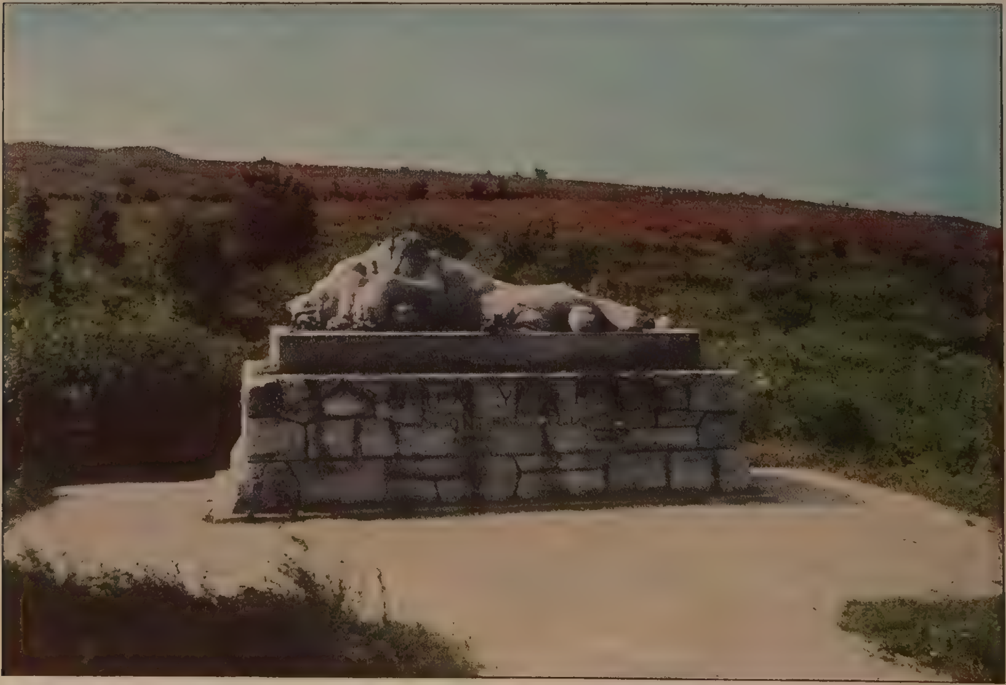
ONE OF THE PIVOTAL QUESTIONS OF THE WAR WAS DECIDED AT BELLEAU WOOD

While no large strategic importance attached to this position, it was here that German and American troops first came to real grips, and it was here that the Americans so magnificently proved their mettle. The field gun still stands in the northern part of the woods just where it was when captured by a battalion of the 5th Marines on June 25, 1918.



NEAR MOUZON THE 2D DIVISION FOUGHT IN THE CLOSING DAYS OF THE WAR

Marching at night with a detachment of German-speaking Americans out in front to answer the challenges of enemy patrols, the Second advanced several miles into hostile territory and captured a number of prisoners, including a German headquarters staff, which they took entirely by surprise. The bowlder carved with the divisional star marks a point of their advance in the vicinity of Mouzon.



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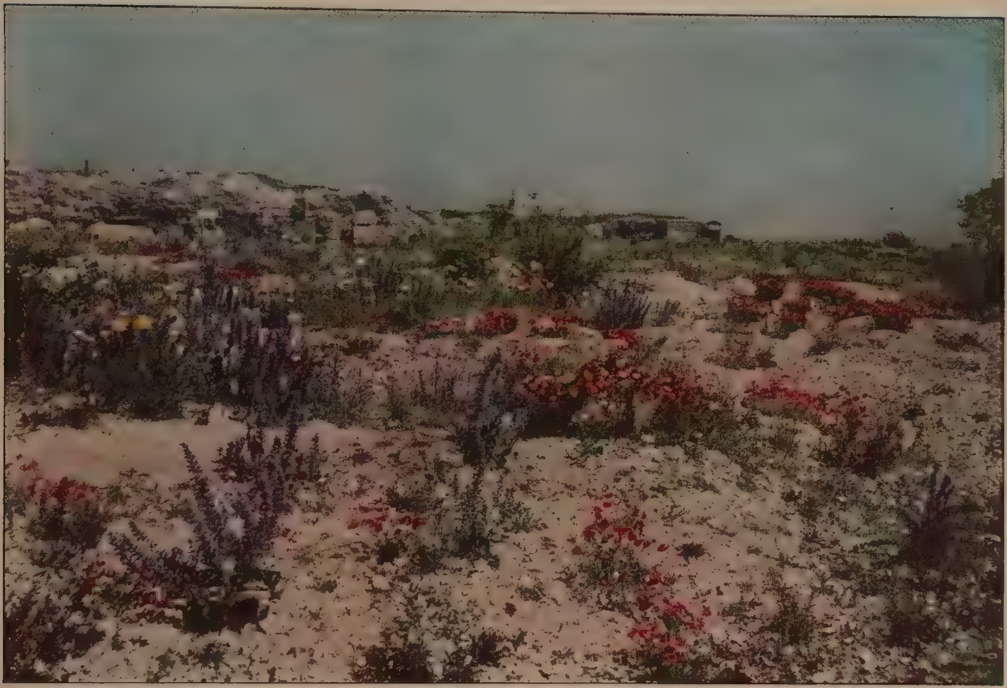
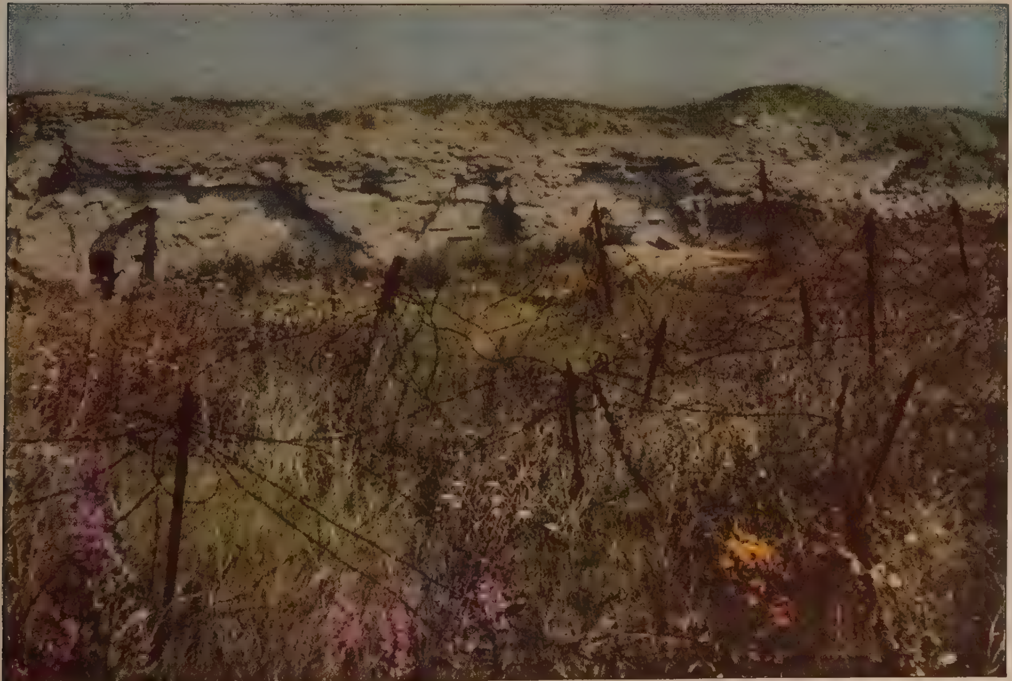
FLEURY WAS AS CLOSE AS THE GERMAN FORCES CAME TO VERDUN

In the spring and early summer of 1916 the flower of the German Army under the personal direction of the Crown Prince launched an attack against Verdun which for sheer weight and ferocity had perhaps never been equaled in the annals of war. On June 23 the gray-clad hosts reached the point marked by this monument at Fleury, near Douaumont, just three miles from the city, before the tide of battle turned and they were driven back.



SOME VAST CATACLYSM OF NATURE MIGHT WELL HAVE CREATED THIS DEVASTATION

A combination of earthquake and volcano could hardly have succeeded in ruining the country about Vaux, one of the Verdun forts, more effectually than did the millions of shells and mines loosed upon it during the World War. Whoever it was who first exclaimed, "Ils ne passeront pas!" (They shall not pass), the French troops made the words theirs and the enemy did *not* pass. A summer growth of flowers now partially hides the devastated soil.



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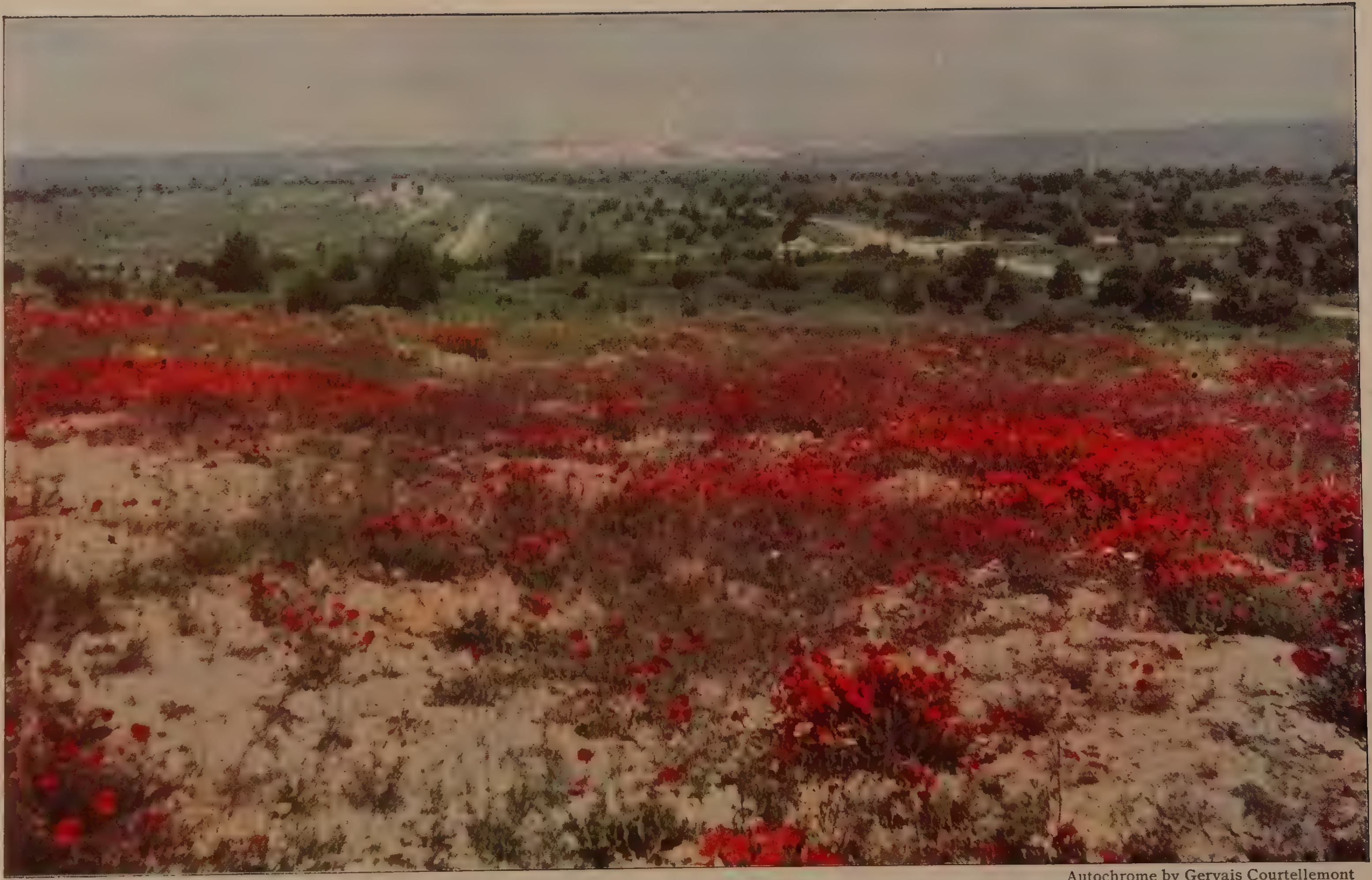
IN A SINGLE NIGHT 200,000 GAS SHELLS FELL ABOUT FORT DOUAUMONT

The walls of this stronghold were so massive that four years of battering failed to demolish them completely. It changed hands several times in the course of the war and cost many casualties on both sides. In four months of offensive operations in the Verdun sector in 1916 Germany sacrificed 400,000 men, while the gallant French defenders on one occasion lost more than 55,000 in a day. The barbed wires remain much as they were eleven years ago.



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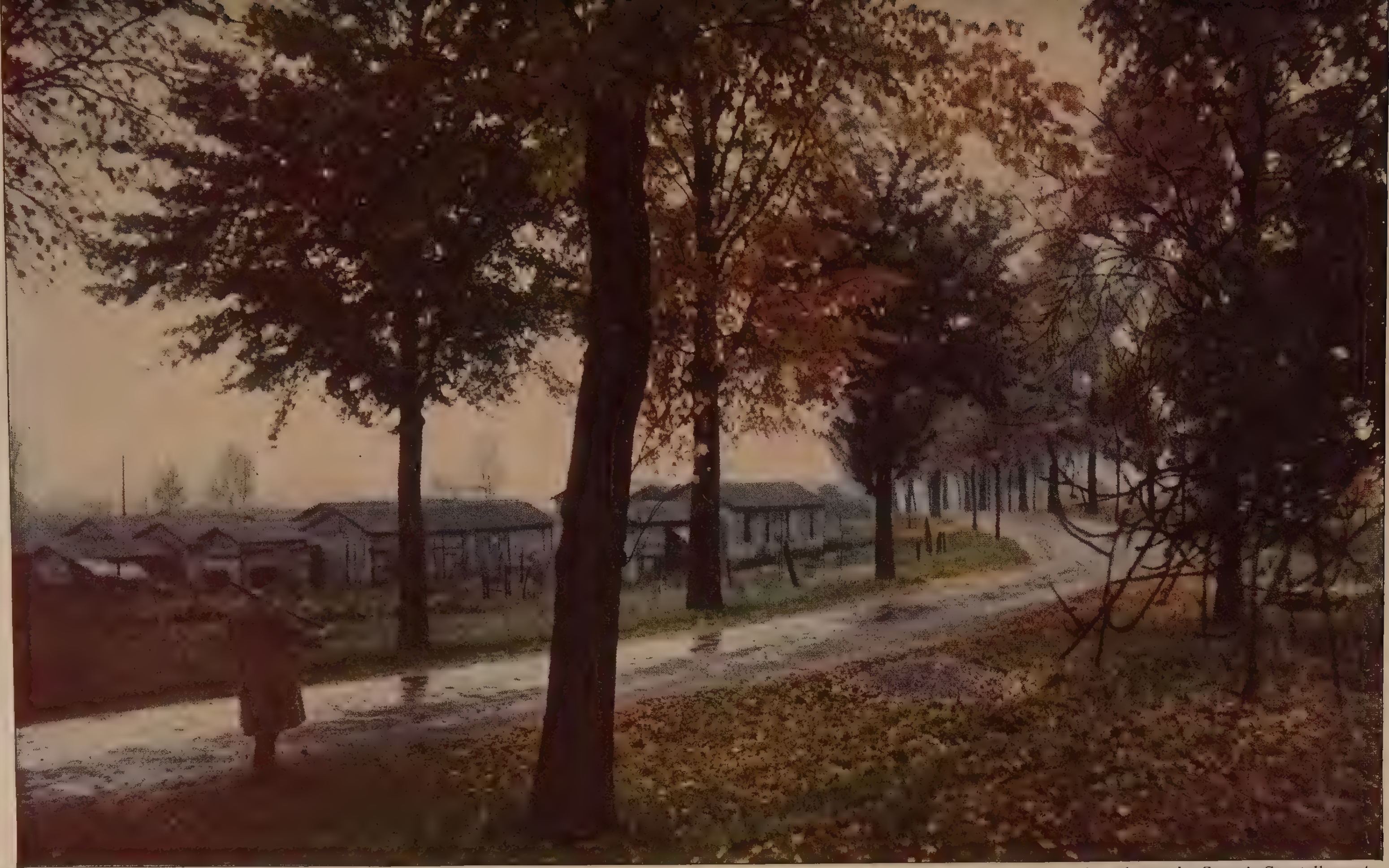
THE FIELD OF VERDUN EVER WILL REMAIN A MONUMENT TO THE VALOR OF FRANCE

For nearly a year this extensive area on the right bank of the Meuse was the scene of titanic conflict. The Germans attacked again and again with reckless disregard for human losses and the French put every ounce of a strength born of desperation into repulsing them. In the distance is the Douaumont monument, surrounded by a vast cemetery where lie thousands of those unknown heroes who "barred the way to Verdun." Near by is the so-called "Trench of Bayonets" where a French detachment was buried by a bursting shell and never disinterred. Their bayonets still protrude



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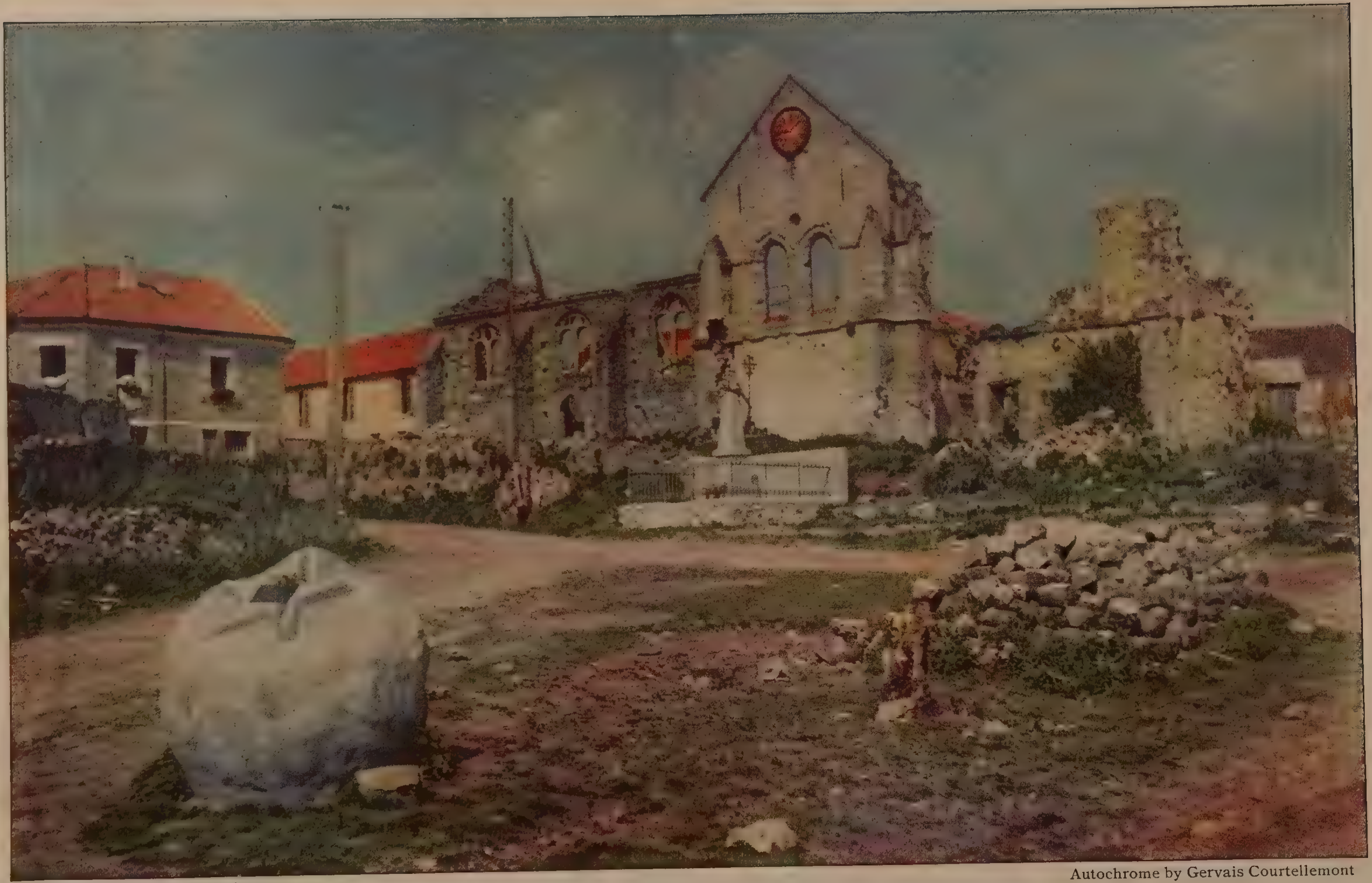
WHEN THE HOUR OF THE ARMISTICE STRUCK MEN OF BOTH THE 1ST AND 42D DIVISIONS WERE AT THE GATES OF SEDAN

Although in the closing days of the war American troops were approaching the city from two sides, there were excellent reasons why the French were given the honor of being first to enter. For it was at Sedan in 1870 that Napoleon III's army surrendered to the Germans, and brought to a virtual conclusion the brief but disastrous Franco-Prussian War. The barracks along this road from Stenay to Sedan were used by the American troops after the Armistice and now house workmen.



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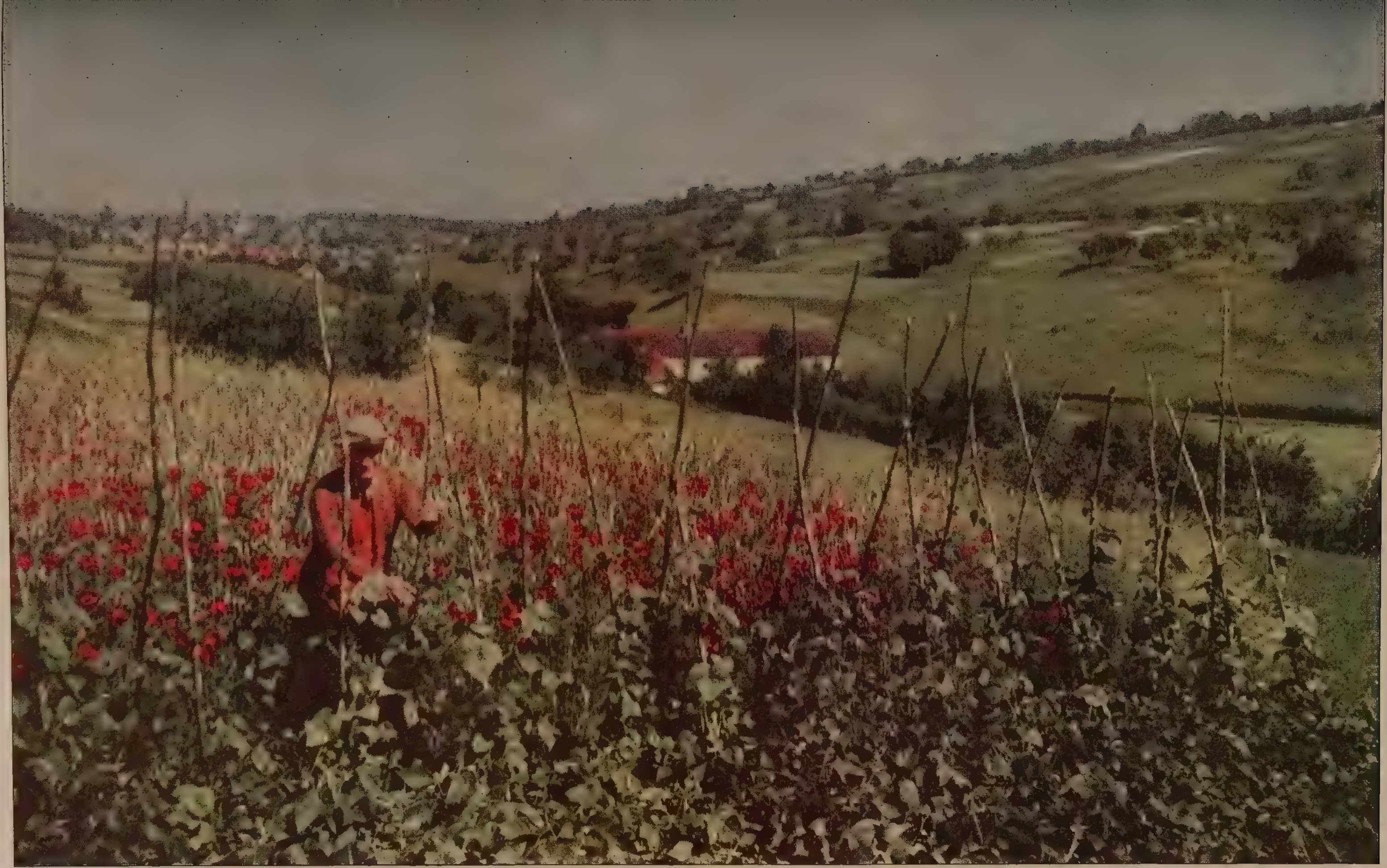
AN INFERNO OF BURSTING SHELLS LAID WASTE TO LUCY-LE-BOCAGE

This village is just south of Belleau Wood (see Color Plate I) and many of the wounded in that battle were treated here before being taken to hospitals in the rear. At a culvert just outside of the village a detachment of American naval medical officers of the 4th Brigade of Marines maintained an advanced dressing station. Note the 2d Division's star and bowlder monument (see also Color Plate II). The church and many of the houses have



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HERE IN THE SUMMER OF 1918 THE DESTINY OF CIVILIZATION WAS DECIDED

At Château-Thierry Germany's final advance on Paris was turned back in some of the fiercest fighting of the World War. A little to the west of the town lies the hamlet of Vaux and Hill 204. This eminence was an enemy stronghold which Franco-American troops captured after overcoming a desperate resistance. Only the extreme newness of everything serves to remind one now of the ghastly June days eleven years ago, when everything—woods, gardens, and houses—had been destroyed.

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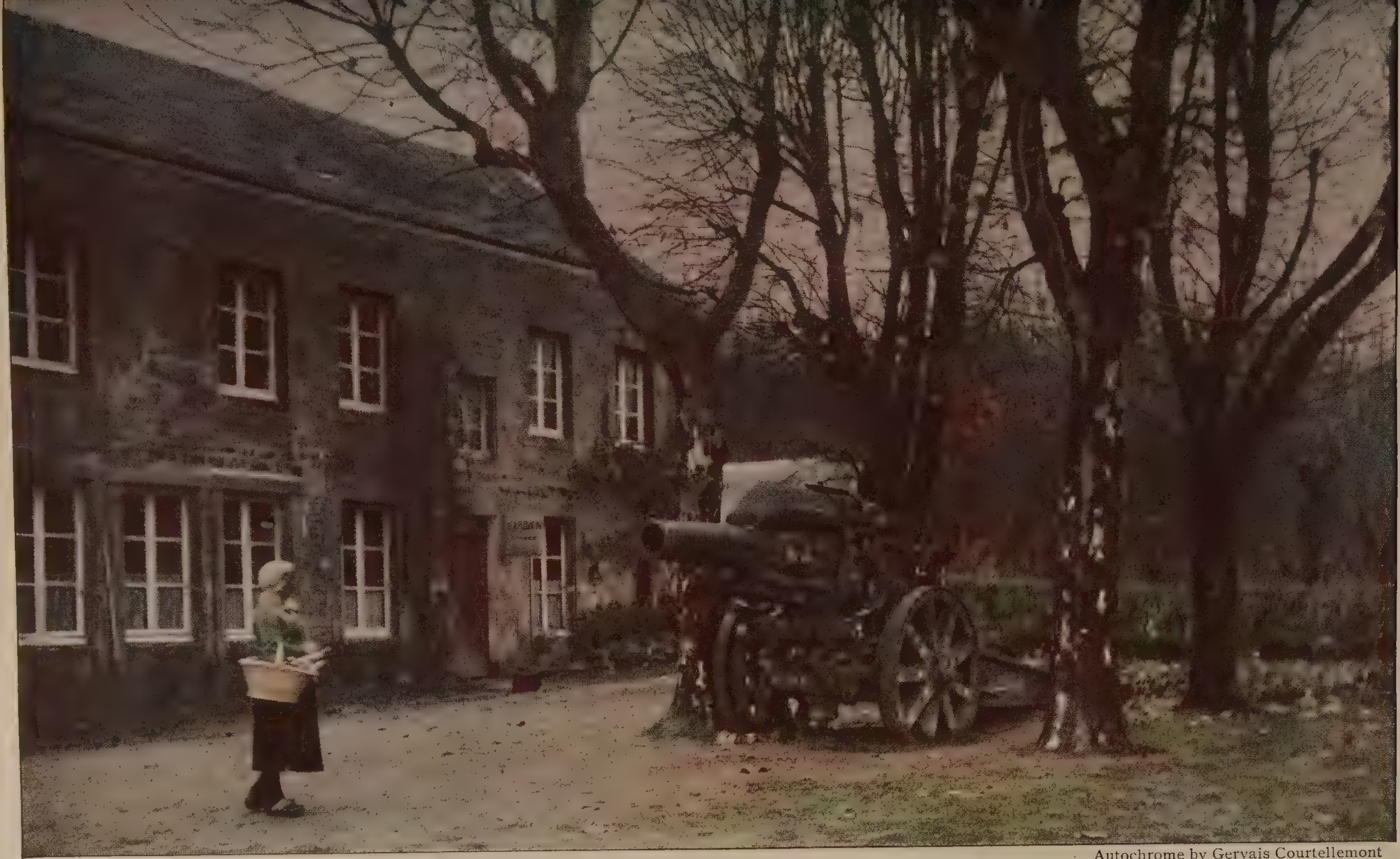
MONTFAUCON: NOT MANY MILES FROM HERE THE HEROIC "LOST BATTALION" MADE ITS PLACE IN HISTORY

In the great Meuse-Argonne engagement of 1918 six companies of the 308th Infantry, one of the 307th, and parts of two companies of the 306th Machine Gun Battalion were entirely surrounded by the enemy, and cut off from the rest of their division. For five days and four nights they held their position against repeated assaults and bombardments. Food and water became scarce and their suffering was acute, but they spurned surrender. Finally on October 7 they were rescued, but of the 463 men who were cut off, 225 were killed and wounded. Montfaucon proved a hard position for



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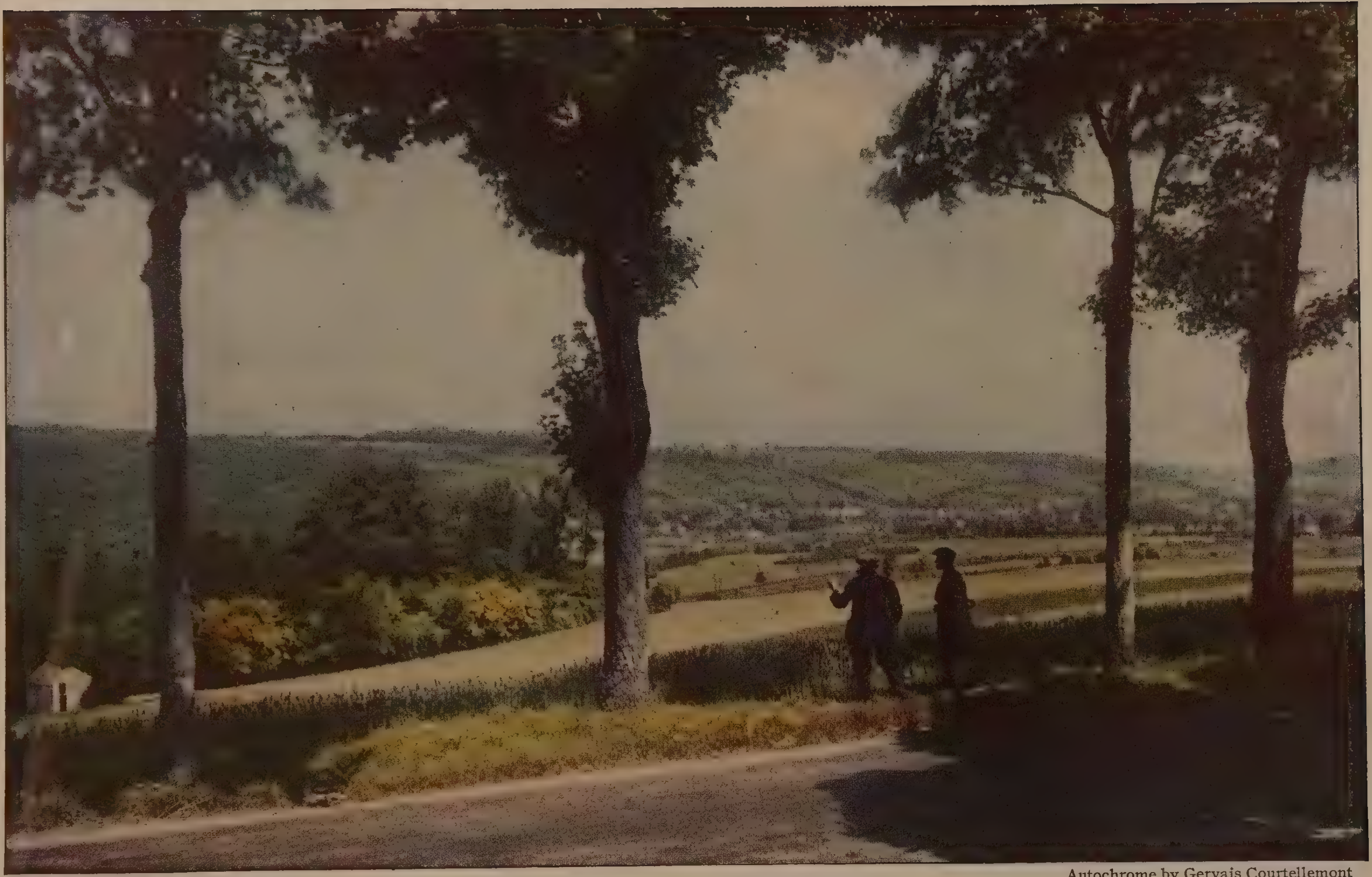
THE COUNTRY ABOUT SEDAN IS RICH IN MEMORIES OF 1870

To the relics of the Franco-Prussian War which are gathered at Bazeilles has been added this piece of heavy artillery which was taken by the advancing Allies from a stone quarry where it stood in battery protecting the German retreat. The museum at the threshold of which it has been placed is the celebrated "Last Cartridge House" of Alphonse de Neuville's well-known picture reproducing an episode of the War of 1870—that of the heroic defense made by a handful of French soldiers in this besieged building.



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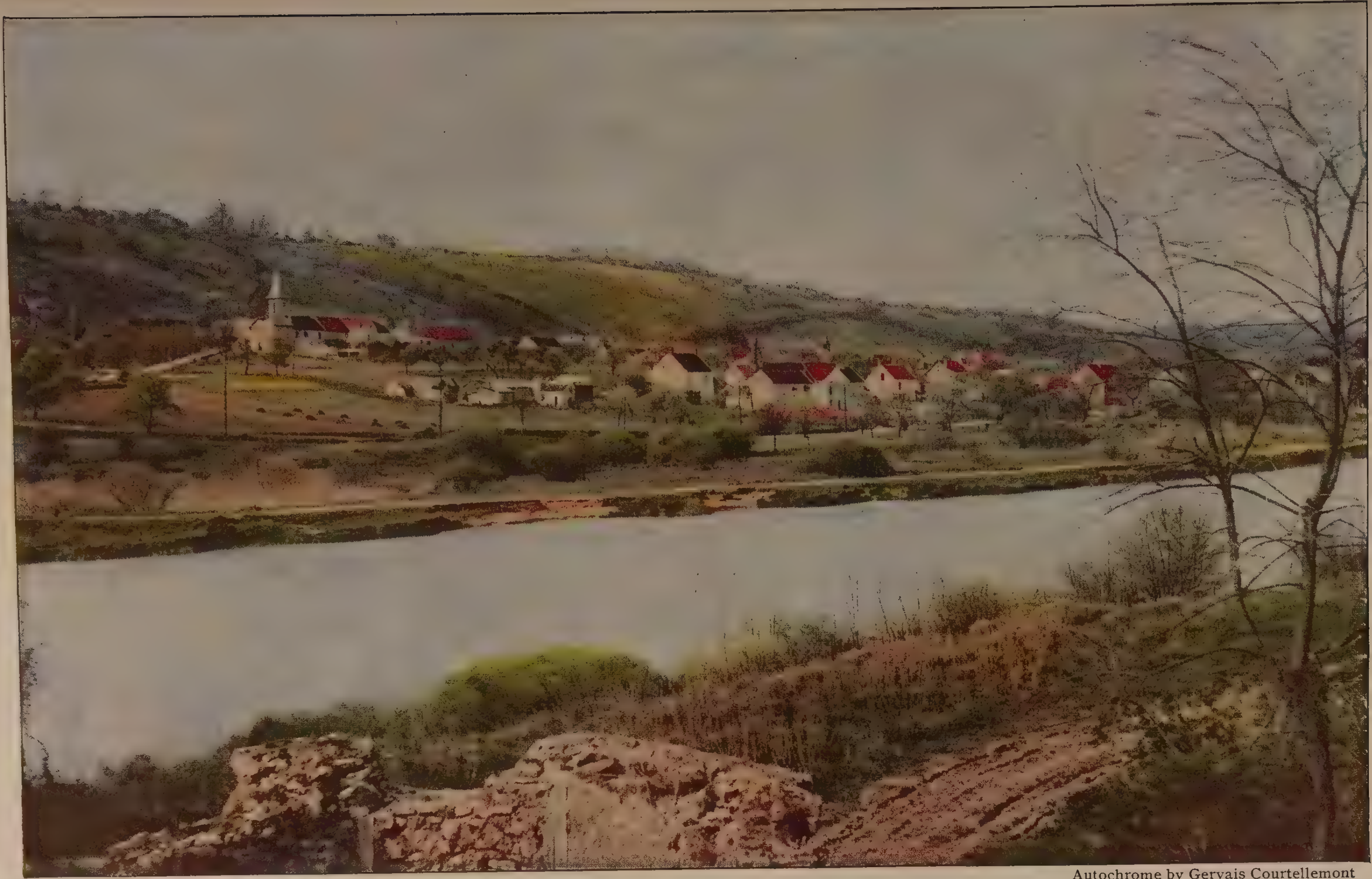
THE MARNE VALLEY AT JAULGONNE

A general panorama of an American battle field. After having crossed the Marne on a bridge of boats, the Americans stormed the wooded hills to occupy the German position at the top.



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SINCE THE DAYS OF ATTILA AND HIS DEVASTATING HORDE, THE VALLEY OF THE MARNE HAS BEEN NO STRANGER TO THE WAYS OF WAR: JAULGONNE VILLAGE, NEAR CHÂTEAU-THIERRY

In the background is the wooded hill which American troops captured by storm to take possession of the woods west of Jaulgonne in July, 1918. The village has been, in large part, reconstructed since the Armistice.

NEW VILLAGES RISE PHOENIXLIKE FROM RUINS OF THE OLD

Artillery bombardments such as the world had never dreamed of left much of France a waste. So well, however, did her people apply themselves to the tasks of reconstruction that new communities have sprung up on every hand from the débris of those destroyed in the World War. The rebuilt section of Lucy-le-Bocage.

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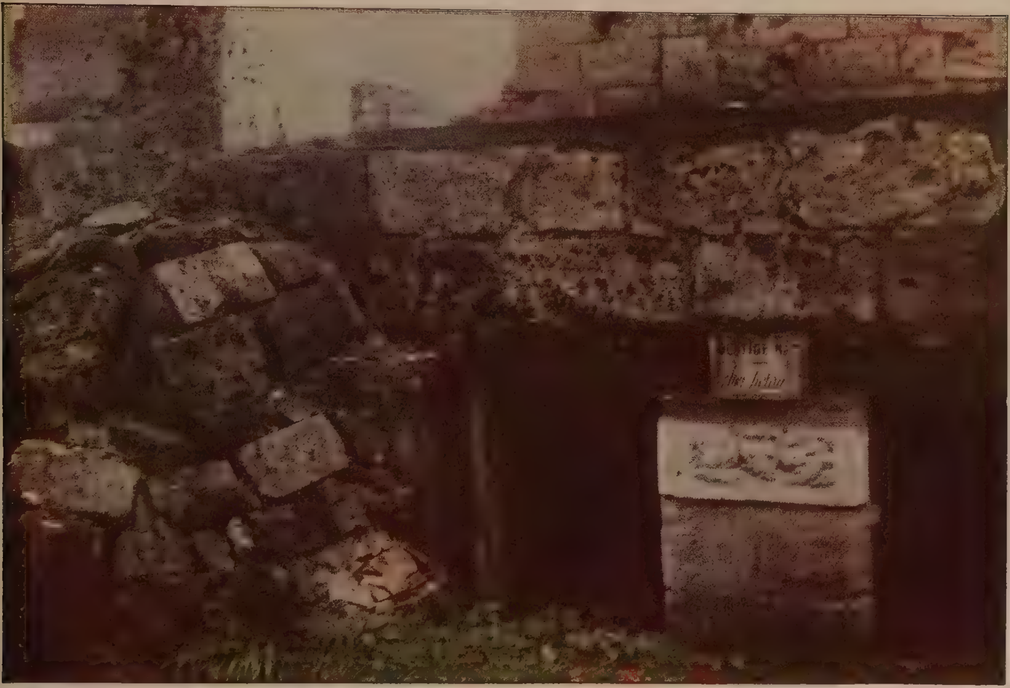
ST. MIHIEL STILL FEELS HER WOUNDS

The town's prosperity before the World War was due in large measure to its activities as a frontier military post. With the international boundary changed and the garrison quartered elsewhere, business is dull in St. Mihiel.



POILU AND DOUGHBOY CLASP HANDS IN STONE

The battle areas of France are besprinkled with monuments and memorials. This one in Montfaucon was carved by soldiers of the victorious Franco-American army at the entrance to a concrete shelter built by the Germans among the ruins of a church. An American soldier's hand shakes a French soldier's hand.

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RUINS OF THE CHÂTEAU DE VIGNEULLES, IN THE VICINITY OF HATTONCHÂTEL

Near here in September, 1918, advance elements of the 1st and 26th Divisions met and closed the St. Mihiel salient, thus cutting off the escape of such of the enemy's retreating soldiers as had not yet succeeded in getting out.

SOLITUDE AND DESOLATION PERVADE BOIS DE MORT MARE ON THE ST. MIHIEL BATTLE FIELD

A crumbling house which sheltered American soldiers in 1918.

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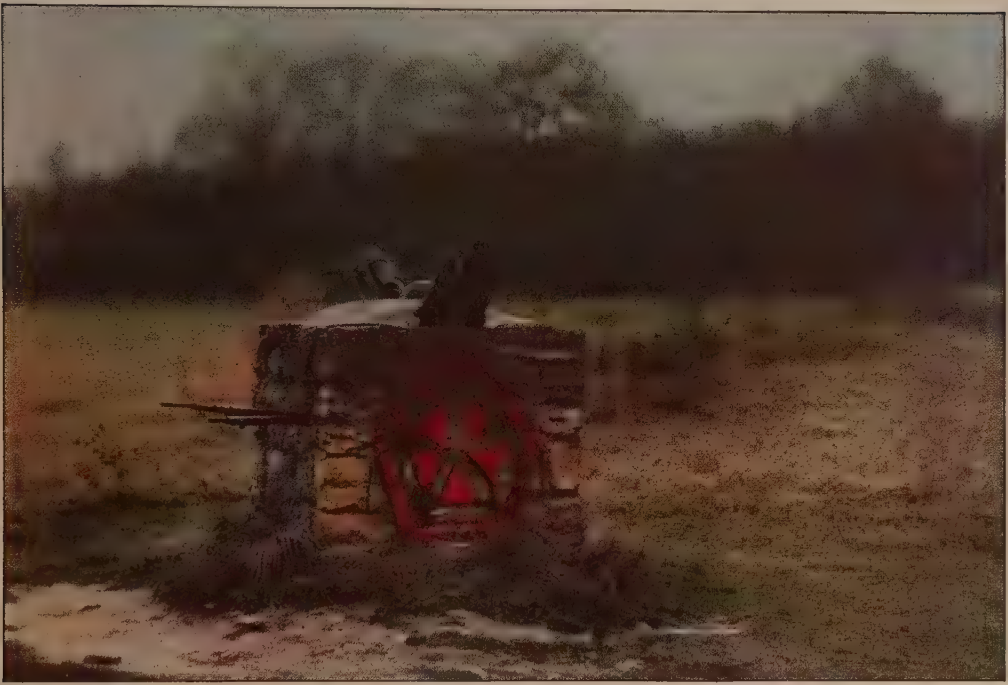
ELEVEN YEARS HAVE NOT SUFFICED TO EFFACE ALL EVIDENCE OF CONFLICT

Rebuilding has been slow in some parts of the devastated area. At Lucy-le-Bocage gaping holes in roofs, crumbling walls and piles of masonry and plaster are not uncommon sights.



TRENCH MORTARS AND RIFLES SET IN STONE RECALL AMERICAN EXPLOITS NEAR MOUZON

The inscription is "Fifth Corps—November 11, 1918."

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THE BARBED WIRE ENTANGLEMENT AND DEEP TRENCHES IN LE PRÊTRE WOODS

Along the south front of the St. Mihiel salient the Germans constructed an elaborate system of these defenses. Some of them presented formidable obstacles to the advancing Americans.

THEIR RATTLING HAIL OF DEATH FOREVER STILLED

German machine guns performed with deadly effect against American troops in Belleau Wood. The guns were captured during the fierce battles for possession of the wood in 1918 and remain as they stood eleven years ago.

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A SYMBOL OF THE WAR GOD'S FOUR-YEAR REIGN OF TERROR

The gun is an Austrian 88 millimeter and stands in Belleau Wood. Its high-velocity shells, which traveled faster than sound and burst suddenly without the usual warning scream, were known to the soldiers as "whizz-bangs." It has been allowed to remain on the very spot where it stood in battery in the copse, under the bracken. This part of Belleau Wood has been constituted a permanent memorial.

each other, he stopped at a place where the upper part of a rifle barrel appeared above the ground. A little farther another was to be seen; then another and another, in an irregular line. We were in front of the now famous Trench of the Bayonets (see Plate IV and page 548).

Some men of the 137th Infantry, the General explained, had been ordered to hold it at any cost. They were standing in it, rifles in hand, when a discharge of the enemy artillery fell on the very spot, upset the earthworks, and buried the occupants alive. There they stand, holding till the end of time the trench entrusted to them. A monument, due to American generosity, the gift of Mr. George B. Rand, now protects it.

Memorials of this sort, raised to the French by the Americans and to the Americans by the French, abound along the former front.

TRIBUTES OF FRIENDSHIP FROM GREAT WAR LEADERS

It has been observed in the course of history that allies, when the fight is over, are apt to bestow parsimonious praise on their associates, as if the greater such praise the less their own glory. Nothing of the sort was seen between us in the Great War. The Marne and Verdun were nowhere more admired than in the States, and the French sentiment for the Americans never wavered.

Most of their fighting divisions were mentioned in the orders of the French Army for all our troops to know of their valor. More than one division had several times that honor, bestowed in words carefully chosen, accurately recalling the occasion therefor; the same for the ambulance sections. Those orders are indeed worth keeping in each regiment's archives, for they are founded on facts; they were written on the moment; they are history, not empty words.

The great war leaders, in their public addresses and in their private conversations, as I can testify—Marshal Foch, Marshal Pétain, General Gouraud, and others—expressed just the same opinion as that recorded in the orders.

Many in the United States still remember the speeches delivered there by Marshal Foch in the course of that triumphal journey which he undertook in order to thank those who had helped him to victory. That journey further increased his sentiment for them; their activity, their youthful buoyancy, their cheeriness, their optimism went to his heart. He returned delighted with his voyage, pleased to think, as we read in one of the best, among the innumerable books written about him after his death, Major Bugnet's, that he had "helped to keep up among the Americans those sentiments of fraternal generosity which caused them to fight so heroically by our side.

"The Marshal has," the Major continues, "the same affection for the Americans as they show him. He doubtless smiles at times at their exuberance, but he is full of friendly good will toward them, because they act, because they build, because they do things. Just as they, he does not like corrosive, negative, destructive irony.

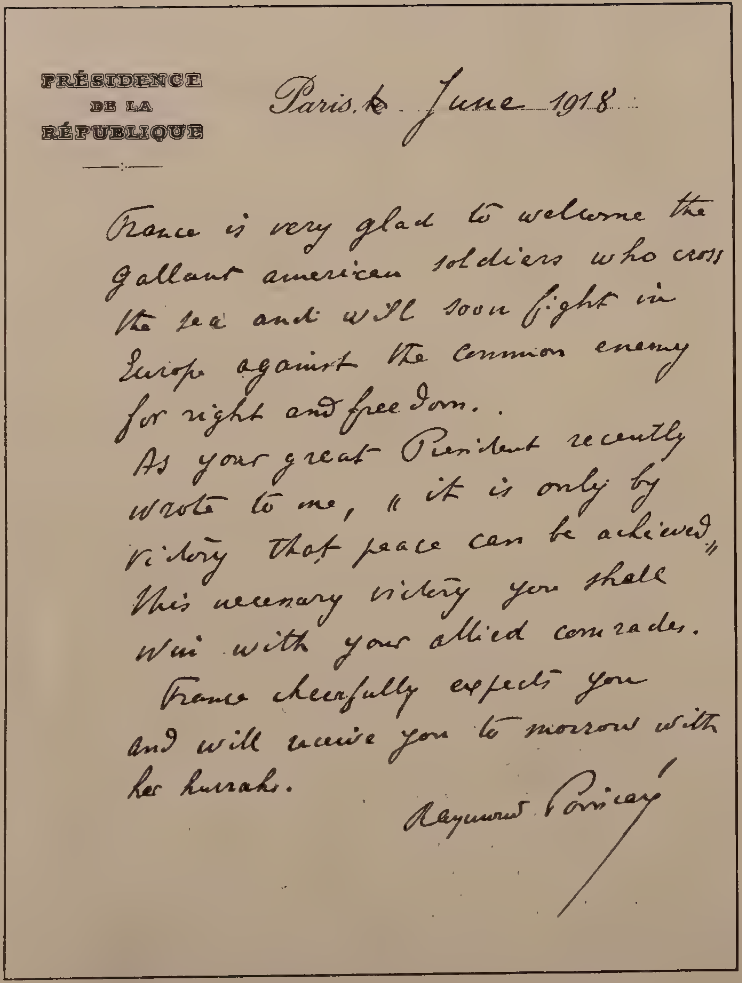
"He does not conceal his warm sympathy for their spirit of enterprise, nor a certain admiration for their methods, which tend to develop rather the character than the intellect. 'Consider America,' would he say, speaking of her youth, 'they are a vigorous lot, physically and morally. They go to school; and then, at twenty, they are launched out in life. If they don't know, they learn; they work, they extricate themselves. One can succeed only if one wills.'"

Speaking at the Suresnes Cemetery last May, General Gouraud said:

"Having had the honor to have under my orders three American divisions, and to attack in Champagne at the same time that General Pershing was attacking in the dense forest of Argonne and on the fire-swept glacis of Montfaucon, I can conscientiously render homage, once more, to the vigor, the courage and tenacity, of the American armies."

FRENCH HISTORIANS RECORD MUTUAL ESTEEM

In many French books and articles written after the war, the same sentiment is expressed; such books as that of Lieut. Colonel (now Major General) de Chambrun and Captain de Marenches, *L'Armée Américaine dans le Conflit Européen;* the before-quoted *Story of the Lafayette*



PRÉSIDENCE
DE LA
RÉPUBLIQUE

Paris, le June 1918

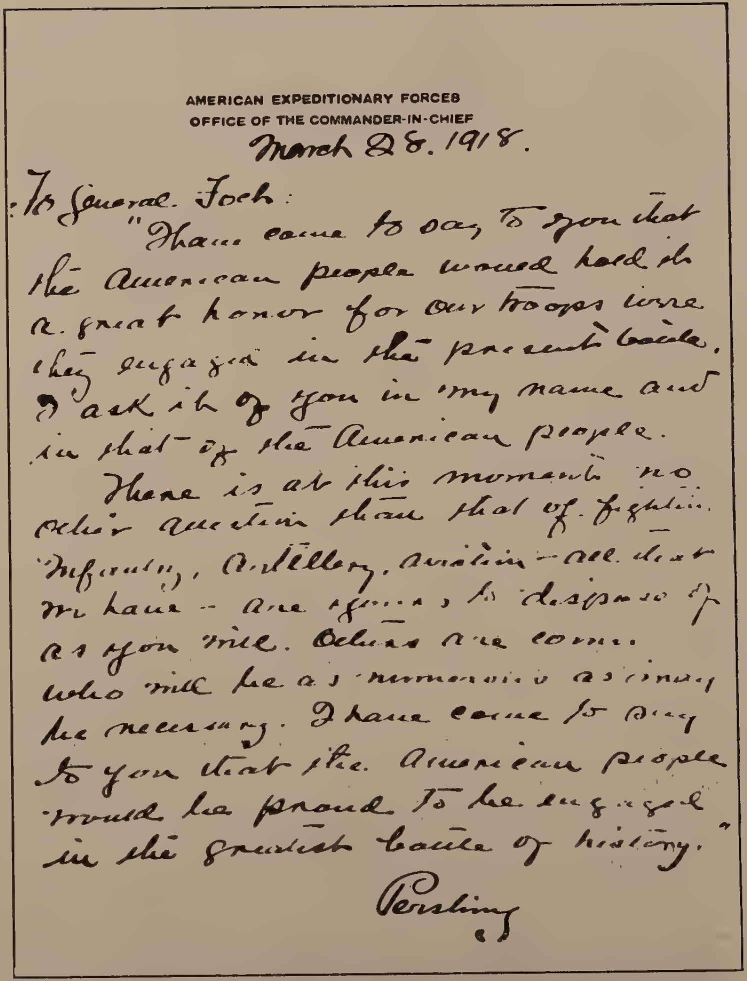
France is very glad to welcome the gallant american soldiers who cross the sea and will soon fight in Europe against the common enemy for right and freedom.

As your great President recently wrote to me, "it is only by victory that peace can be achieved." This necessary victory you shall win with your allied comrades.

France cheerfully expects you and will receive you to morrow with her hurrahs.

Raymond Poincaré

PRESIDENT POINCARÉ SENT A CORDIAL GREETING



AMERICAN EXPEDITIONARY FORCES
OFFICE OF THE COMMANDER-IN-CHIEF

March 28. 1918.

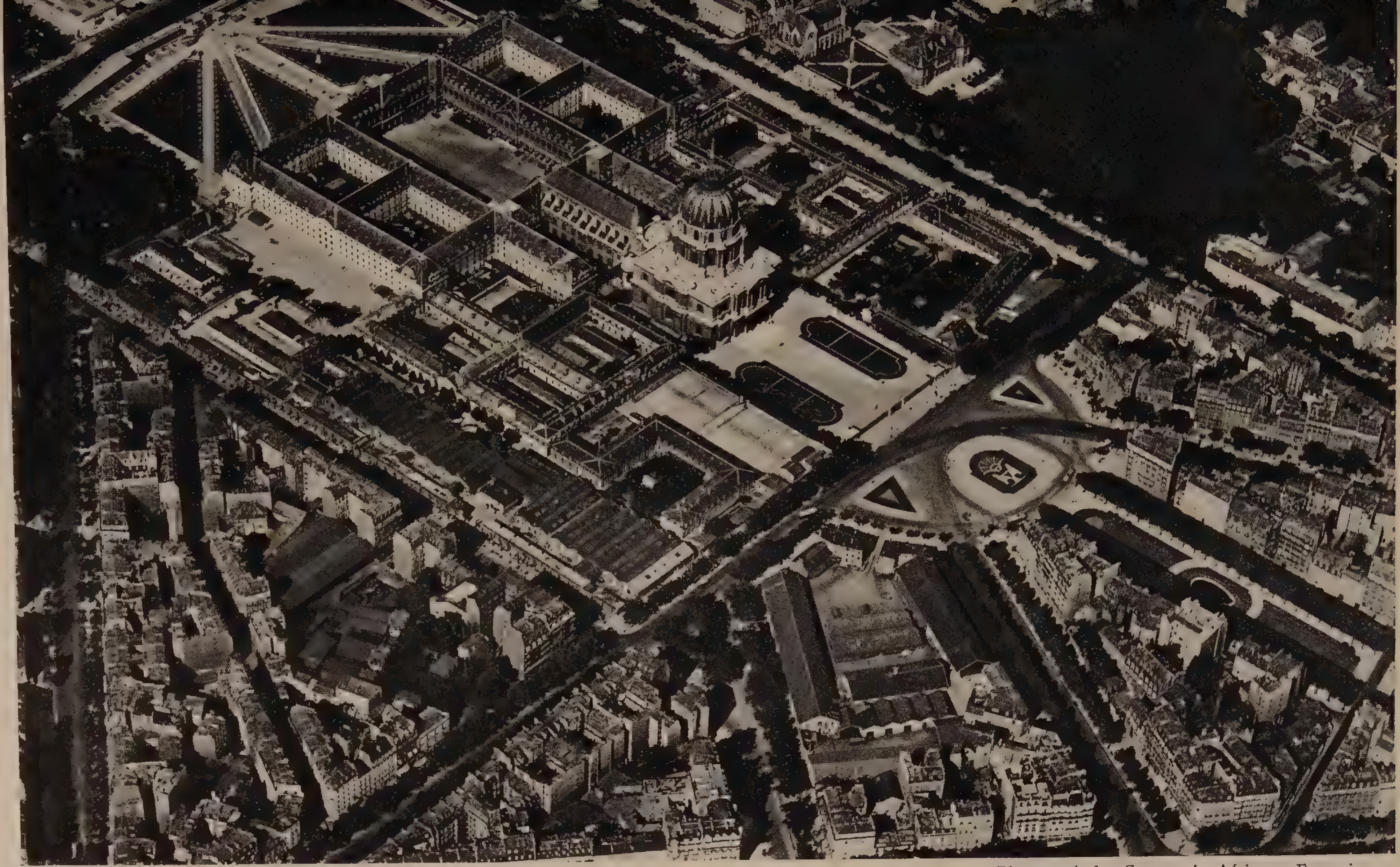
To General Foch:

"I have come to say to you that the American people would hold it a great honor for our troops were they engaged in the present battle. I ask it of you in my name and in that of the American people.

There is at this moment no other question than that of fighting. Infantry, artillery, aviation—all that we have—are yours to dispose of as you will. Others are coming who will be as numerous as may be necessary. I have come to say to you that the American people would be proud to be engaged in the greatest battle of history."

Pershing

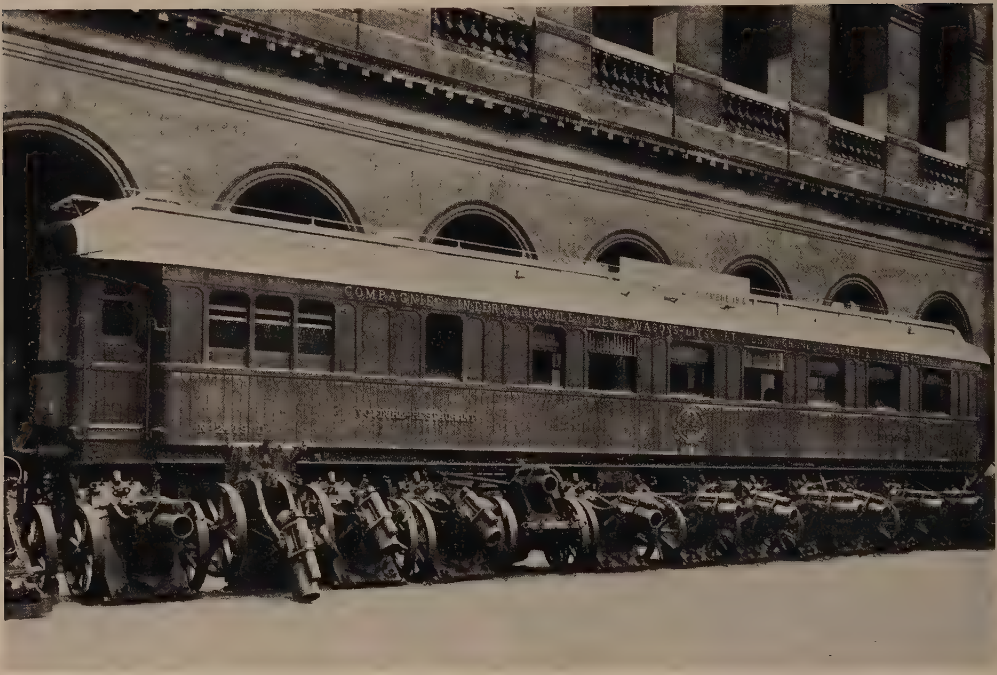
PERSHING'S MESSAGE TO FOCH WAS BRIEF AND SOLDIERLY



Photograph by Compagnie Aérienne Française

HERE LIVES FOR AYE THE SPIRIT OF MILITANT FRANCE

The Hôtel des Invalides, founded by Louis XIV and begun in 1671, was built to house 5,000 to 7,000 disabled veterans, but to-day it is a museum of arms and shelters only about 80 old soldiers, who act as guides. The seat of French military affairs was moved to this building in 1898. Under the dome is the tomb of Napoleon. At the right side of the rectangular court, shown slightly above and to the left of the main structure, is the railway coach in which the Armistice was signed (see, also, illustration, page 542).



Photograph by Ewing Galloway

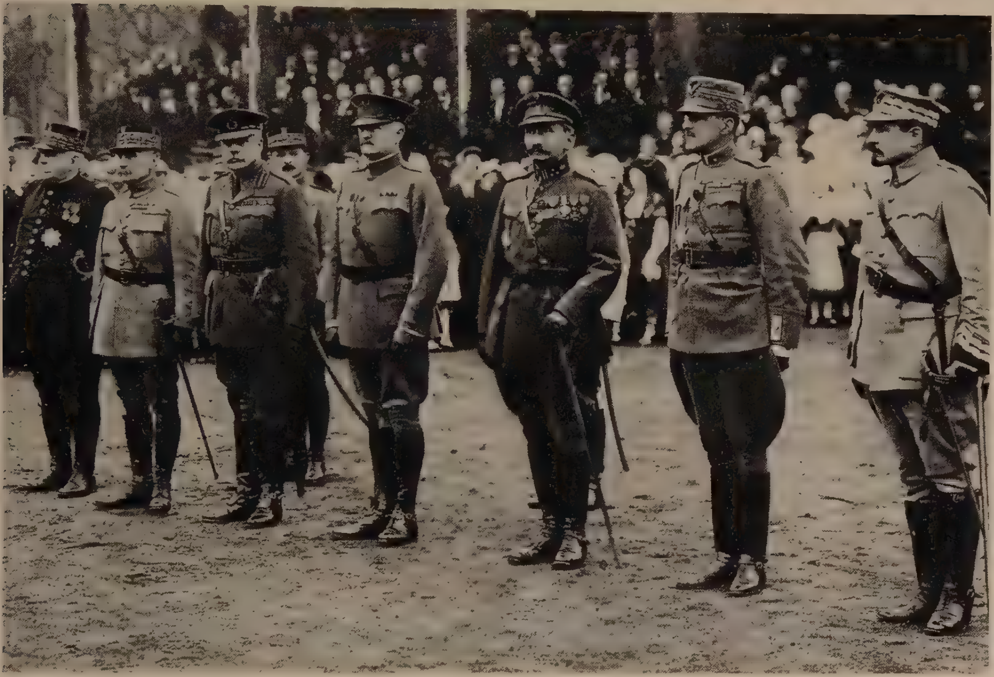
IN A SIMPLE RAILWAY CAR THE ARMISTICE WAS SIGNED

No panoply of glory surrounded the men who brought to a close the greatest war in history. The coach wherein the actual ceremonies took place now stands in the court of the Hôtel des Invalides, in Paris.

Photograph by U. S. Army Signal Corps

FRENCH GRANDMOTHERS INTRODUCE BOYS FROM OVERSEAS TO THE NATIVE ARGOT

American soldiers spent much of their time while resting behind the lines in trying to master the language of the country they had come so far to help defend.



FAMOUS SOLDIERS HONOR A COMRADE IN ARMS

At the ceremonies when General Pétain was made a marshal, Marshals Joffre and Foch represented France; Field Marshal Haig, Great Britain; General John J. Pershing, America; General Gillain, Belgium; General Albricci, Italy; and General Haller, Poland.

Photographs by U. S. Army Signal Corps

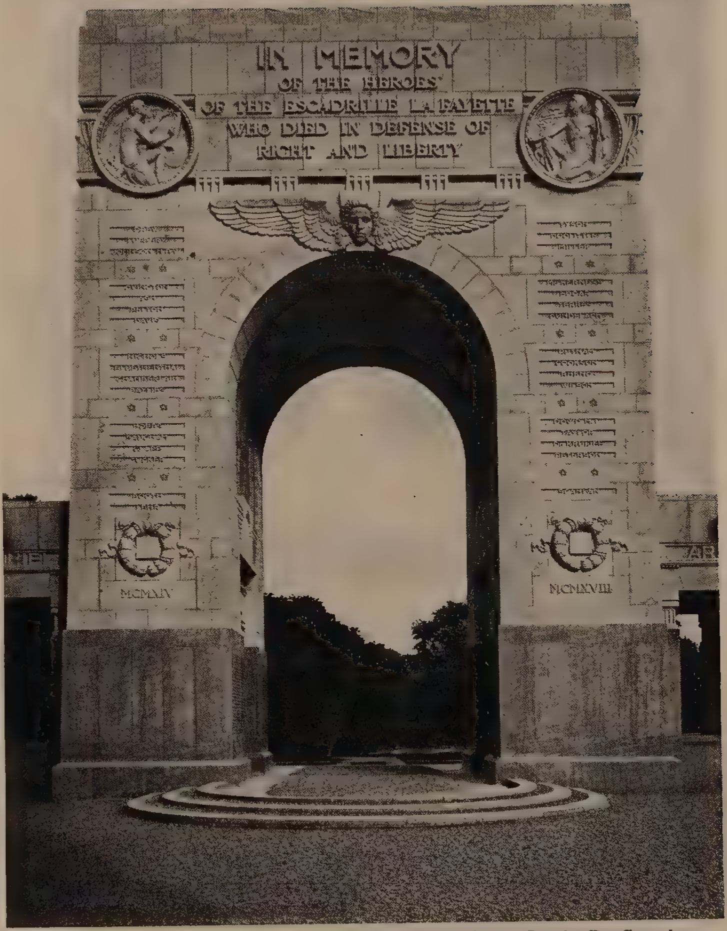
FRANCE LENDS A HAND ON WASH DAY

A typical French peasant woman is helping an American doughboy to wring out his laundry. The soldier seated, with a child on his knee, was killed in action a few days later.

Photograph by Clifton Adams

A WAR-SCARRED ROAD NEAR CHÂTEAU-THIERRY

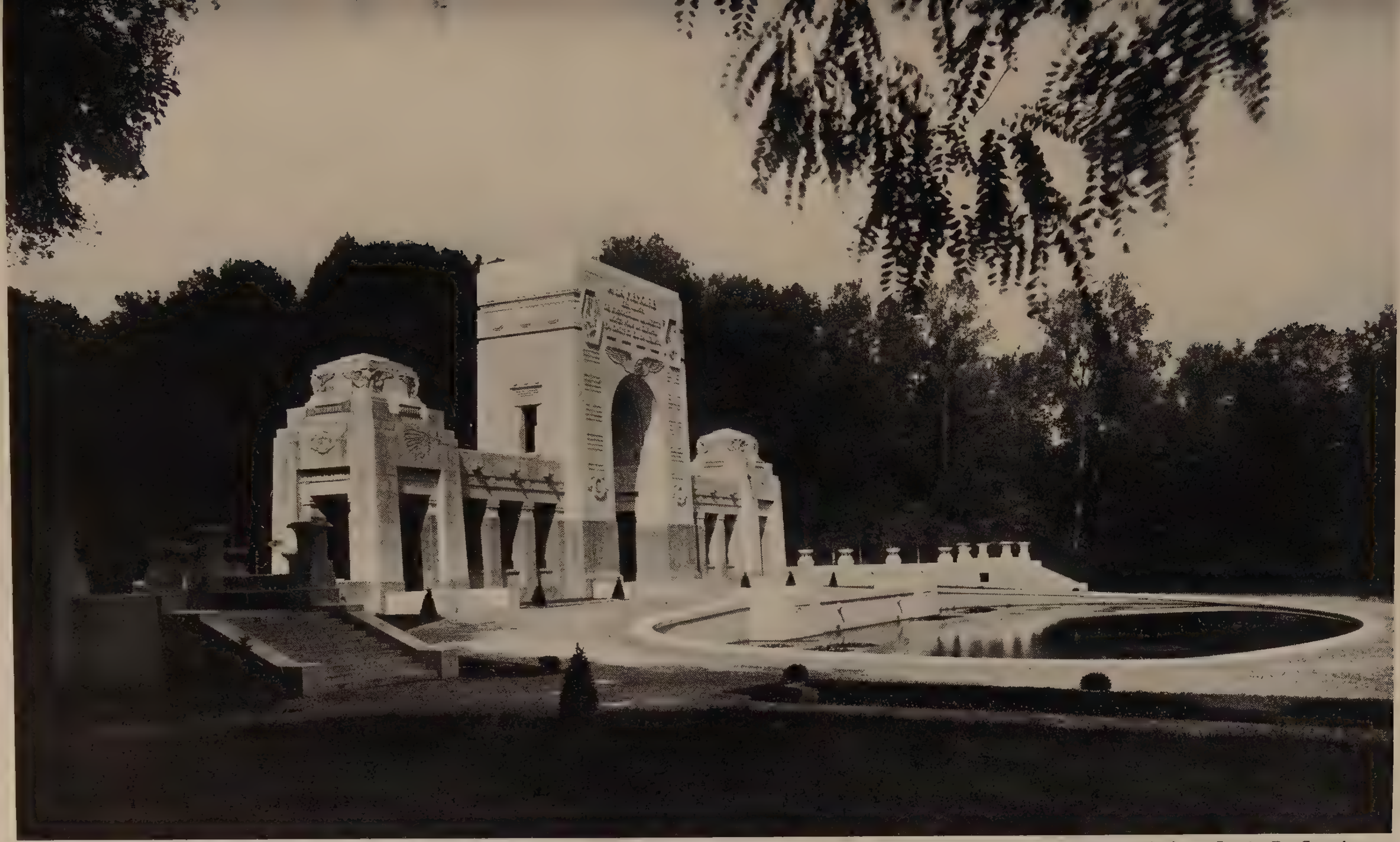
Where before the war great trees formed arches of foliage over the highways, only ravaged trunks remained after four years of intermittent machine gun fire and artillery bombardment.


IN MEMORY
OF THE HEROES
OF THE ESCADRILLE LAFAYETTE
WHO DIED IN DEFENSE OF
RIGHT AND LIBERTY
MCMXIV
MCMXVIII

Photograph from Lewis D. Crenshaw

MEMORY O'ER THEIR TOMB A STATELY TROPHY RAISED

Above the archway at the back of the Layafette Escadrille Memorial appears in English the same sentiment that is inscribed in French on the front (see illustration on opposite page).



Photograph from Lewis D. Crenshaw

HERE SLEEP 67 AMERICAN EAGLES WHO DIED FIGHTING FOR FRANCE

The magnificent Lafayette Escadrille Memorial, which stands in the park of Villeneuve l'Étang, halfway between Paris and Versailles, was dedicated with impressive ceremony on July 4, 1928, in the presence of Marshal Foch, Minister of War Painlevé, Ambassador Herrick, and scores of flying aces of both the United States and France. On the faces of the arch are inscribed the names of the dead and the living members, both of the Escadrille and the Lafayette Flying Corps (see, also, text, pages 509-511).

© Underwood and Underwood

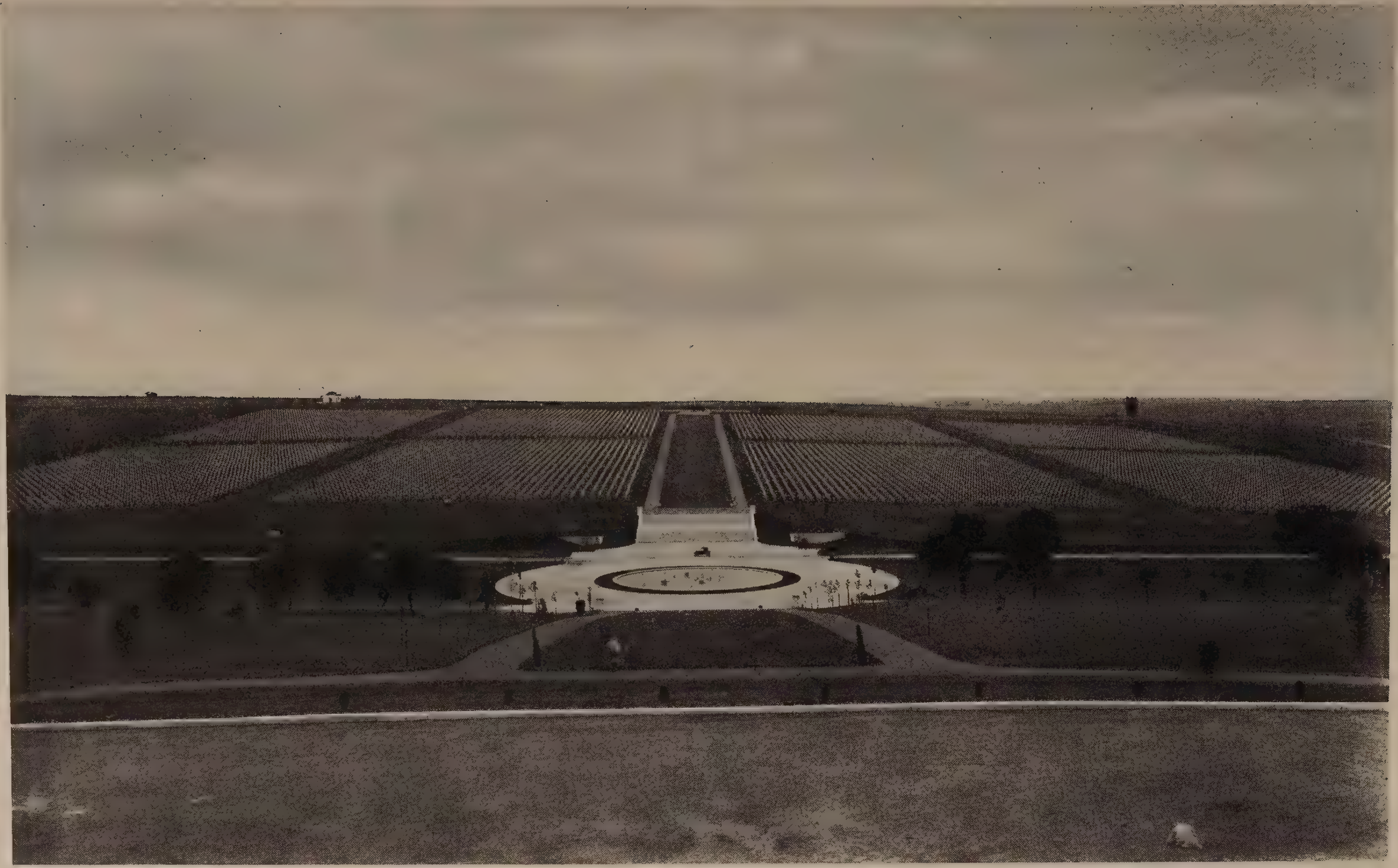
“LES AMÉRICAINS” SEE SOMETHING OF ABSORBING INTEREST

These fortunate young members of the A. E. F. were billeted in a French town famed afar for the beauty and charm of its feminine

Courtesy American Legion Monthly

“OLD GLORY” FLOATS ABOVE A BIT OF HALLOWED GROUND

Under the shadow of their country’s flag, in the cemetery at Suresnes, near Paris, 1,506 Americans rest forever in the foreign soil they died to defend.



Photograph by U. S. Army Signal Corps

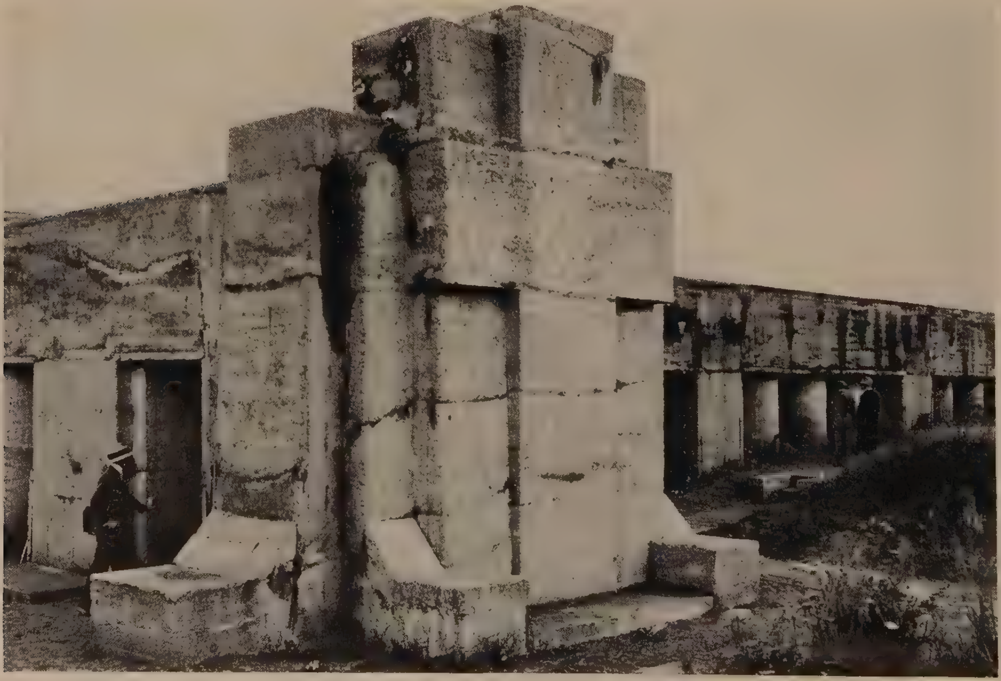
THE DEAD WHO REST AT ROMAGNE-SOUS-MONTFAUCON REPRESENT NEARLY EVERY DIVISION OF THE A. E. F.

More than 14,000 of those who gave their lives for their country in 1917-1918 are buried in this largest of American overseas cemeteries. Most of them died in the Meuse-Argonne operation, one of the decisive battles of the war.

Photograph by Maynard Owen Williams

THE NATIONAL GEOGRAPHIC SOCIETY'S MEMORIAL AT THE SCENE OF AMERICA'S FIRST VICTORY IN THE WORLD WAR

In memory of our participation in the great conflict, The Society's membership erected at Cantigny a beautiful fountain and presented the rebuilt town with a complete water-supply system. The presentation was made on Bastille Day (July 14), in 1923.



Photograph by Holmes from Galloway

VERDUN KNOWS NO MORE TRAGIC SPOT THAN THE TRENCH OF THE BAYONETS

This concrete structure forever preserves the celebrated place where a detachment of French soldiers was buried alive by an exploding shell (see text, page 522, and Color Plate IV).

Escadrille, by Major Thénault (see text, page 510); the *Américains à Brest* of Mr. Chevrillon (see text, page 509), and several others. In the first of these works is the complete text of all the French citations in honor of the American units.

Civilians felt the same. As an example may be quoted the resolution voted, after the Belleau Wood victory, "in a congress of the mayors of the Meaux District, on the 25th of June, 1918," and which reads:

> "The mayors of the Meaux District, who were eyewitnesses to the generous and efficacious deeds of the American Army in stopping the enemy advance, send to that Army the heartfelt expression of their admiration and gratitude."
>
> (Signed) "G. LUGOL,
>
> *"Mayor of Meaux and Deputy of Seine-et-Marne."*

An address recently presented to the President of the United States has shown him that the memory of the unique services rendered by "Mr. Herbert Hoover" to the famished inhabitants of our devastated regions during the worst period has not and shall not sink into oblivion.

The twenty-five thousand or more American Legionnaires who revisited France two years ago and walked in the midst of enthusiastic crowds from the foot of the statue of Washington, Place d'Iéna, to the distant portals of Notre Dame, can testify to the liveliness of the still-surviving sentiment; by its warmth it was, in spite of the flight of time, a striking reminder of the reception given to the first American troops seen in Paris ten years before, when they had come as the harbingers of victory.

Photograph by U. S. Army Signal Corps

"ENTENTE CORDIALE"

Many a lasting friendship was established between the American soldiers and the French people with whom they lived and suffered during the years of the war.

FRANCE IS NOT FORGETTING

And just now, as I write, while the question of the debts is being debated in the French Chamber, not without asperity, Foreign Secretary Briand has chosen that moment to remind his hearers and the country at large of what we owe to the States, saying:

"I want that, in the midst of those discussions, sometimes bitter, people may feel the beatings of the heart of France and know that her gratitude still lives. . . . It is the duty of the one who has to-day the honor of directing the foreign policy of his country to cry out to that great, friendly people beyond the sea who have played their part in an especially dolorous hour in our history: 'France does not forget what you have done for her, be assured of that, and in spite of the untoward remarks which may be occasioned by this discussion about the debts, her gratitude remains intact, deep-seated in her heart.' "

Prolonged applause greeted those words.

Photograph by De Cou from Galloway

ROW AFTER ROW OF WHITE CROSSES MARK THE GRAVES OF AMERICAN DEAD

In the years since the World War thousands of friends and relatives from the United States have made the solemn pilgrimage to the graves of their warrior dead in France. Most of those buried in this cemetery lost their lives at Belleau Wood and Château-Thierry.

Signs abound indeed that France does not forget. At the long-established French Mint, Quai de Conti, Paris, where events in the history of the country are commemorated in bronze, silver, and gold, two parallel series of medals, preserved in the same glass case, are of special interest. One, by famous engravers of those days, tells of American Independence, of the relief of Boston by Washington, the Battle of Cowpens, the surrendering of Burgoyne at Saratoga, of "Libertas Americana" won at Yorktown, and includes portraits of Franklin, Lafayette, Paul Jones; the other, begun a century and a half later, engraved also at the time of the events, shows the landing of the first American troops in 1917, the taking of Saint-Mihiel; represents General Pershing and, among others, the late departed beloved Ambassador of the United States, Myron T. Herrick.

An extraordinary similitude between the two series of events is thus recalled. The similitude is so great that, in a number of cases, the leaders in the recent drama used unawares the same words and acted in the same fashion as their forbears in the days of the War of Independence.

We had declared then, in advance, that we would accept no recompense, no annexation, no compensation of any sort, stating, in the only treaty of alliance ever concluded by America, that we "renounced forever the possession . . . of any part of the continent of America which, before the Treaty of Paris, in 1763, or in virtue of that treaty, was acknowledged to belong to the Crown of Great Britain," and that we had only one object, which was "to maintain effectually the liberty, sovereignty, and independence, absolute and unlimited, of the United States" (February 6, 1778).

A few days later Count Vergennes had written to Marquis de Noailles, French Ambassador in London (and uncle of Lafayette): "We have desired to secure for ourselves no advantage of which other nations might be jealous and which the Americans might regret, in the course of

Courtesy American Legion Monthly

AN AGED FRENCH COUPLE GREET THEIR LIBERATORS

"Who are you? Who won the war?", asked Mr. and Mrs. Jacques Baleaux of these American doughboys in Brieulles, Ardennes, France, when their four years' imprisonment in the town ended, as the Germans retired before the advance of our victorious troops in 1918.

time, to have granted us" (March 10, 1778).

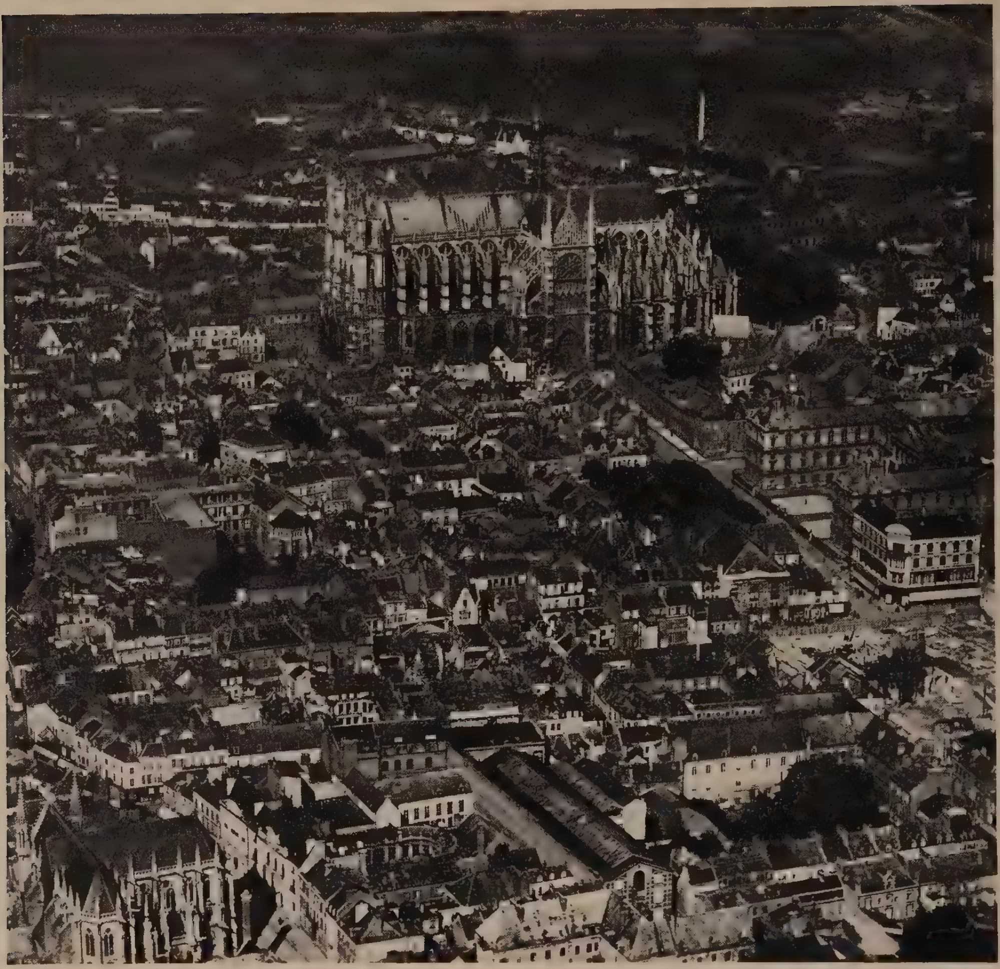
Such a disposition was unexampled then in the annals of mankind. It is no longer unique. When America entered the war President Wilson declared to Congress: "We have no selfish ends to serve. We desire no conquest, no dominion. We seek no indemnities for ourselves, no material compensation for the sacrifice we shall freely make. We are but one of the champions of mankind" (April 2, 1917).

HOW SACRIFICE SERVED THE TWO NATIONS

Thinking of the way the world might be reorganized after the war, the President spoke to me once of his idea of mandates to be established over various African or Asiatic territories; he added that he had not yet definitively adopted it: "Revolve it in your mind and we shall speak of it again." I said, "Will the United States accept any such mandates?" "No," was the answer; "we are debarred by our pledge to accept nothing." And nothing was accepted.

But did the two nations really reap no profit at all by reason of their disinterestedness? Nothing is ever lost. Through our very refusal of any recompense in 1778, we won that American friendship that was to prove of such vital use a century and a half later. As for Americans, they derived from their victorious fight a revelation that, after the passing of so many years of peace and prosperity, they were not, as their enemies fancied, so deeply immersed in material interests that, at the call of Duty, they would not answer, *Adsum,* leaving behind families, wealth, and comfort, risking and often losing their young lives; and this advantage, too, that other nations would also know and be no longer tempted to dictate to them what they should or should not do, and by what lanes their ships should sail.

It is pretty well understood now throughout the world that such challenges would not be allowed to lie dormant, but would



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AMIENS WAS A PLACE OF TREMENDOUS STRATEGIC IMPORTANCE

This city, a junction point between the French and British forces, was the object of determined German attacks in the later stages of the war. Although other buildings suffered heavy damage from bombardment, the exquisite cathedral, with its richly decorated façades, escaped serious injury.

be accepted and with what results; which is for the country no mean advantage.

PERSHING AND ROCHAMBEAU VOICE THE SAME SENTIMENTS

Other similitudes abound. We had pledged ourselves in 1778 to "make all the efforts in our power." America, the President proclaimed, entered the fight to stay in it until "the last gun is fired."

On the 28th of March, 1918, the day after General Foch had been appointed Commander-in-Chief of all the Allied Armies, and the situation, which he was to clear, was so grave, General Pershing came to meet the Commander at Clermont-sur-Oise, and in the courtyard of an old farm, with a cherry tree in full bloom, as a harbinger of spring, he used words so striking that General Foch asked him to repeat them in the presence of the other personages then in the house—Prime Minister Clemenceau, General Pétain, and Cabinet Minister Loucheur.

He repeated them. He was asked to put them in writing. They were sent to the press, went round the country, and created in those dark days an immense sensation. A medal was struck to commemorate them, and it figures now in the

Photograph by U. S. Army Signal Corps

GENERAL PERSHING SPARES A MOMENT TO CHAT WITH A YOUNG ADMIRER

Despite the weight of care and responsibility which was ever his, the Commander of the American Armies found time occasionally to enjoy the company of French children.

aforementioned collection (see text, page 551). It represents on one side the scene as it happened, with good likenesses of the participants; on the other side are engraved the words of Pershing:

"There is at this moment no other question than that of fighting. Infantry, artillery, aviation—all that we have—are yours, to dispose of as you will. . . . I have come to say to you that the American people would be proud to be engaged in the greatest battle of history" (see page 540).

The General had certainly not taken the trouble to inspect, at the Library of Congress, the papers of Rochambeau, whose "visit" he was returning, nor had he any thought of taking his cue from him. The fact is, however, that, shortly after his landing at Newport (after a crossing of seventy days), the French general had written to the President of Congress:

"We are your brothers, and we shall act as such with you; we shall fight your enemies as if we were one and the same nation" (August 3, 1780). To Washington he wrote at the beginning of what was to be the Yorktown campaign: "You will do with me what you please" (March 31, 1781).

Concerning allies, it may again be observed that they happen sometimes to admire each other's deeds of valor without always adding love to admiration. The differences in manners, languages, in the way of reacting under trial, are striking; private sneers sometimes accompany public admiration and friendship does not freely develop. Not so on the two occasions of world-wide importance when the French and the Americans fought the same war.

On the 20th of October, 1782, Washington wrote to Lafayette: "A greater harmony between two armies never subsisted than that which has prevailed between the French and Americans since the first junction of them last year."

On the 25th of July, 1918, I cabled to my Government an account of a conversation I had just had with President Wilson:

"I have spoken to the President of the sentiments of affection and admiration fostered in France by the Americans' fine conduct and, which is no disparagement to heroism, their inborn amiability. The two armies are rivals only in energy and valor, and each day we register with pride the results of their common efforts.

"The President congratulated himself with me on that fraternity of arms, those trials endured together, those victories won in common, which will have the most fruitful consequences later. He expressed the hope that, in spite of an unavoidable slowing up of our advance, a catastrophe was not impossible for the enemy."

In a final telegram sent to his Government just after the Armistice, General Pershing said:

"The French Government and Army have always stood ready to furnish us with supplies, equipment, and transportation and to aid us in every way. In the towns and hamlets, wherever our troops have been stationed or billeted, the French people have everywhere received them more as relatives and intimate friends than as soldiers of a foreign army.

"For these things words are quite inadequate to express our gratitude."

Nothing is more characteristic of those reciprocal dispositions than what took place at Verdun on the morning of that 11th of November, when the last gun was shot and the bugles sounded, "Cease firing!"

On that day, General Valentin told us, a promiscuous group of men wearing American uniforms met before the doors of the ruined cathedral. The enemy, owing to the disposition of the ground, could not see it, but had shelled it by the map, wrecking its old Gothic nave. The leader of the group explained that he was, in private life, a Catholic priest; that those with him were Catholics, Protestants, and Jews. They asked to be allowed to kneel before the altar and sing a thanksgiving hymn for the victory and the peace.

The General considered the request a legitimate one and ordered the doors to be opened. So the Americans, kneeling in the midst of the débris in front of the damaged altar, sang their hymn, and after that sang also the Star-Spangled Banner and the Marseillaise.

EMBLEM OF THE PAST AND THE FUTURE

Thereupon remembering that, while the nave had been shattered, the two towers on the west front had had only scratches, and that therefore the bells must still be there, General Valentin ordered them to be rung; so, for the first time since they had sounded the tocsin for the general mobilization, they pealed forth their chimes for victory. He ordered also the French and the American flags to be raised on the two sister towers, a platoon of French and American soldiers standing at attention.

An emblem of the past and, let us hope, of the future, too.

Well could the American Secretary of War of those days, Mr. Baker, end thus an article he wrote on the participation of the United States in the conflict and on the reasons for its coming in:

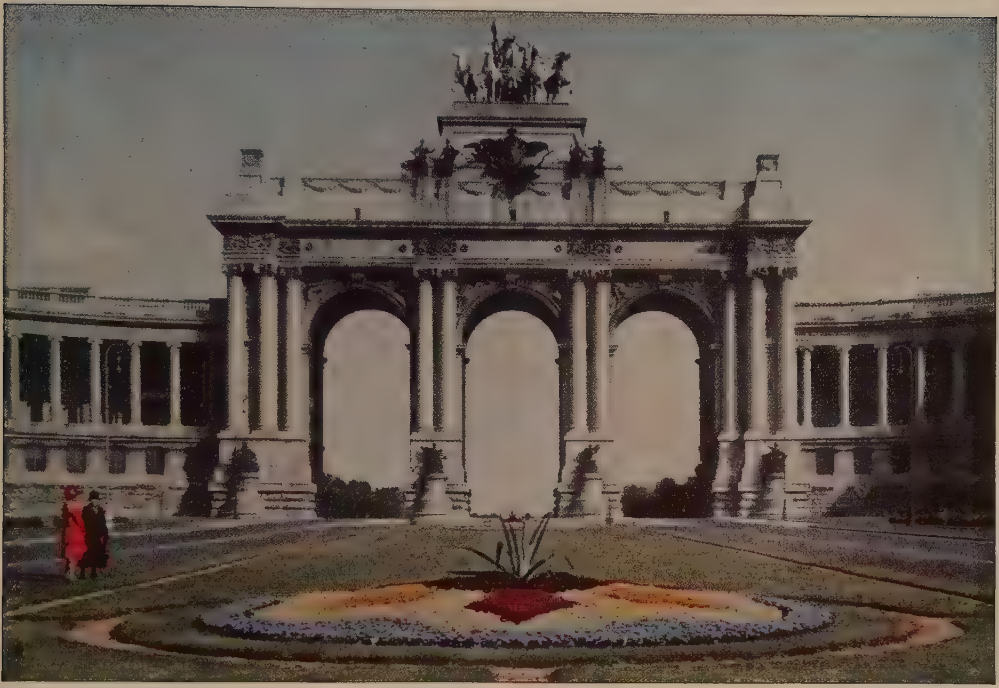
"Those who gave their lives may have had but an inexplicit consciousness of the thing at stake. Yet, in the last analysis, those who died in France died for the same great cause as those who fell at Brandywine. Spiritually, it was the guns of Bunker Hill and Yorktown that answered and overcame the torpedo and the submarine."

* * *

Once more since those great events the bugle has been heard. The Briand-Kellogg pact is an appeal to the world which will bring about results of immense importance, long hoped for in vain by mankind, provided it has been signed not only with golden pens, but with golden hearts, and these two tenets are put at last into practice: less ambition to the detriment of others, more charity.

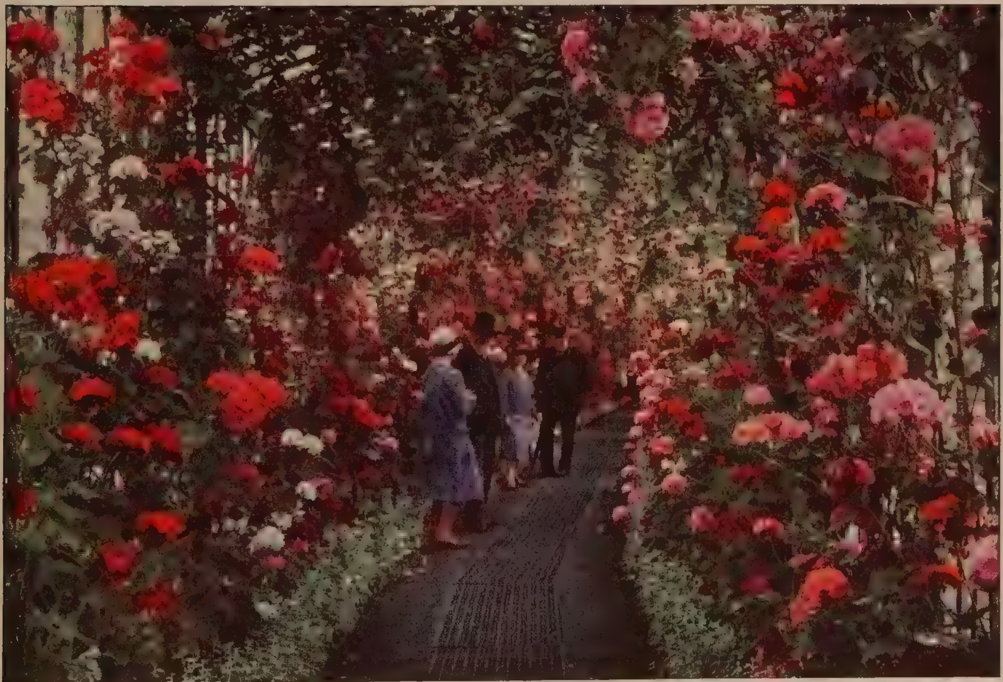
It is a fact, however, and an important one, that once more the bugle has been heard:

"Cease firing!"



A TRIUMPHAL ARCH TO FREEDOM AND UNITY

To finish the colonnade joining the wings of the Palais du Cinquantenaire, dedicated in 1880 on the 50th Belgian Independence Day, Leopold II erected this magnificent memorial at Brussels in 1905. The figures crowning the center represent Belgium and the Province of Brabant; those below the columns, the other provinces.



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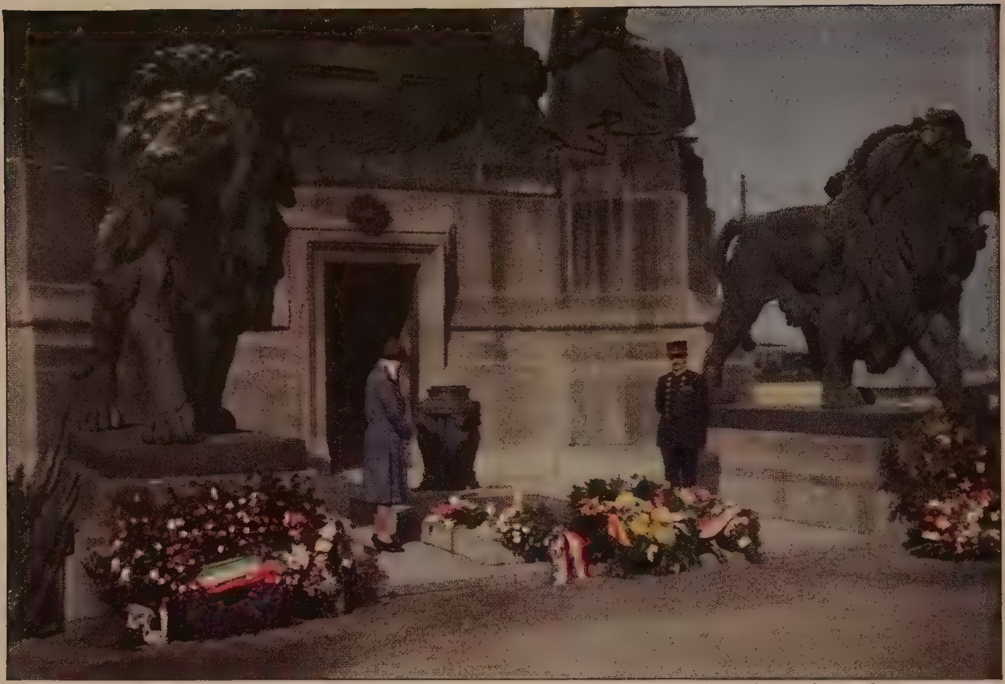
Autochromes by Prof. A. Buyssens

LAEKEN VISITORS WALK THROUGH A BOWER OF BLOOM 500 YARDS LONG

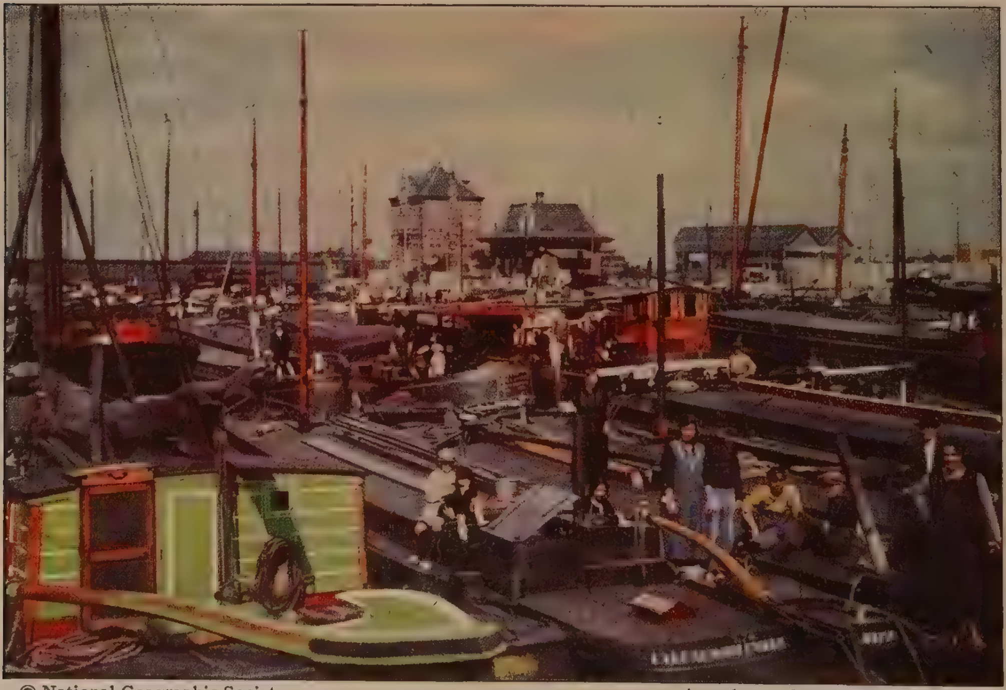
Fortunate indeed is the traveler who comes to this suburb of Brussels in the brief season in spring when the great flower galleries of the Royal Palace are open to the public. The display of azaleas in May is particularly charming. Belgium is a land prodigal of blossoms, but nowhere else in the country is such profusion of loveliness to be seen.



Autochrome by Prof. A. Buyssens

BETWEEN THE LIONS OF BELGIUM SLEEPS HER UNKNOWN SOLDIER

Brussels placed the shrine of the warrior dead at the foot of the Colonne du Congrès, a lofty shaft erected in 1850-59 in commemoration of the Revolution of 1830 and the beginning of Belgian unity. The spot for the grave is well chosen; for the heroic defense in 1914 knit the nine provinces together as never before.



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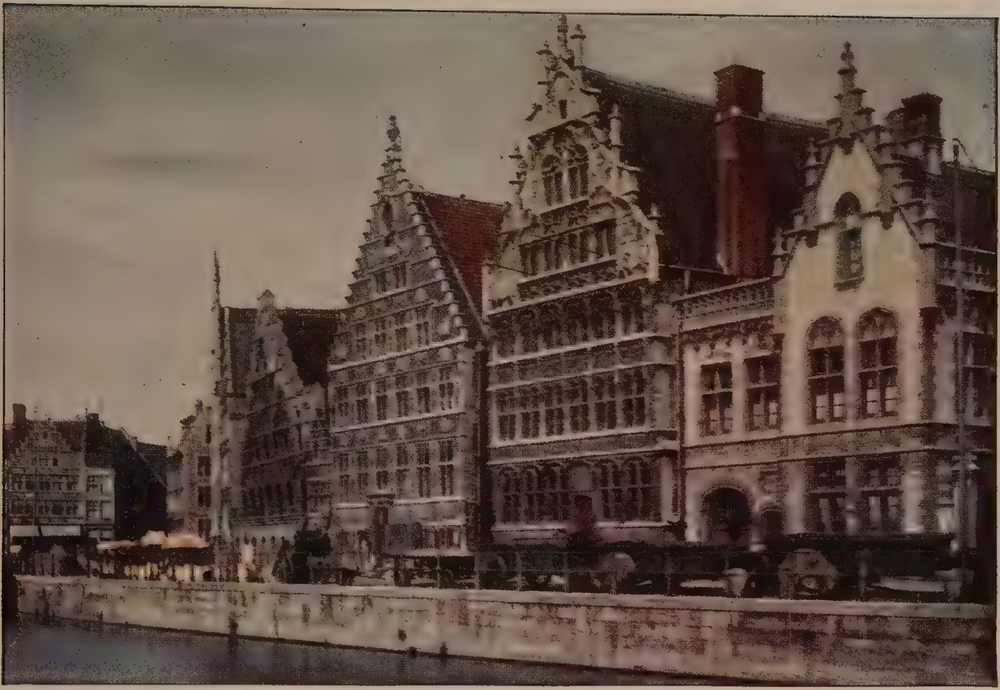
Autochrome by Paul G. Guillumette

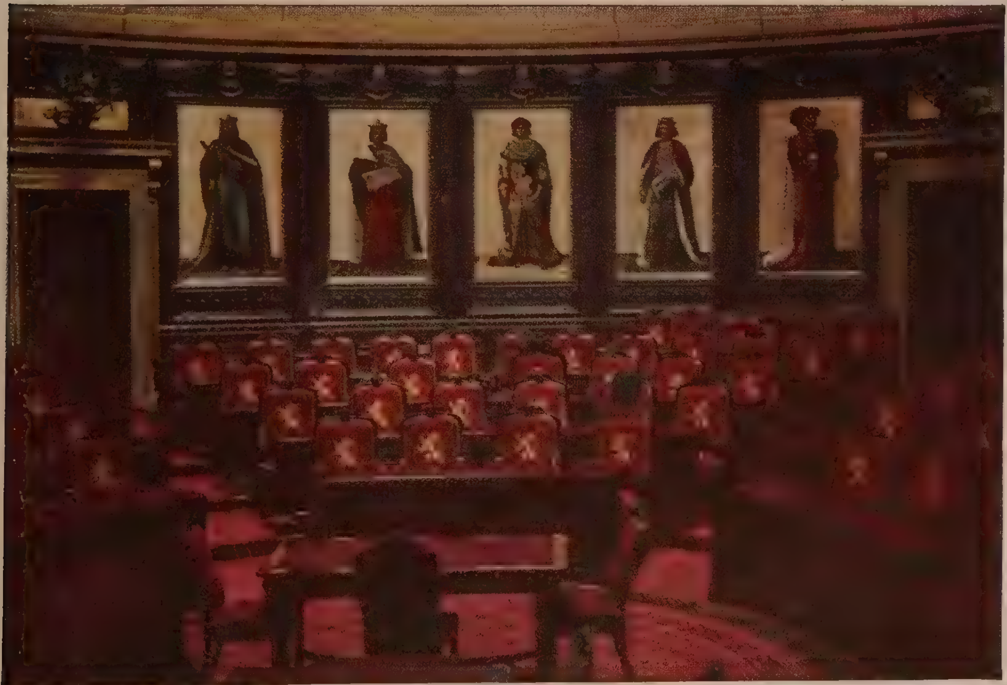
ANTWERP HAS ONE OF THE BUSIEST PORTS IN EUROPE

Begun by Napoleon I and extended in the 19th century, the quays stretch for three and one-half miles along the right bank of the Scheldt. They are equipped with a railway and hauling road. The largest vessels can come alongside without lightering, and ships of all nations may be seen at their moorings or berthed in the docks.



ANCIENT BUILDINGS LEND CHARM TO THE QUAI AUX HERBES IN GHENT

Fronting the River Lys, main artery of commerce, stands (second from the right) the famous Skipper's House, the finest guildhall in Belgium, built in 1531 and restored in 1904. To the left of it is the House of the Grain Measurers, 1698; and beyond that the 13th century Staple House, which burned but was rebuilt in 1896.



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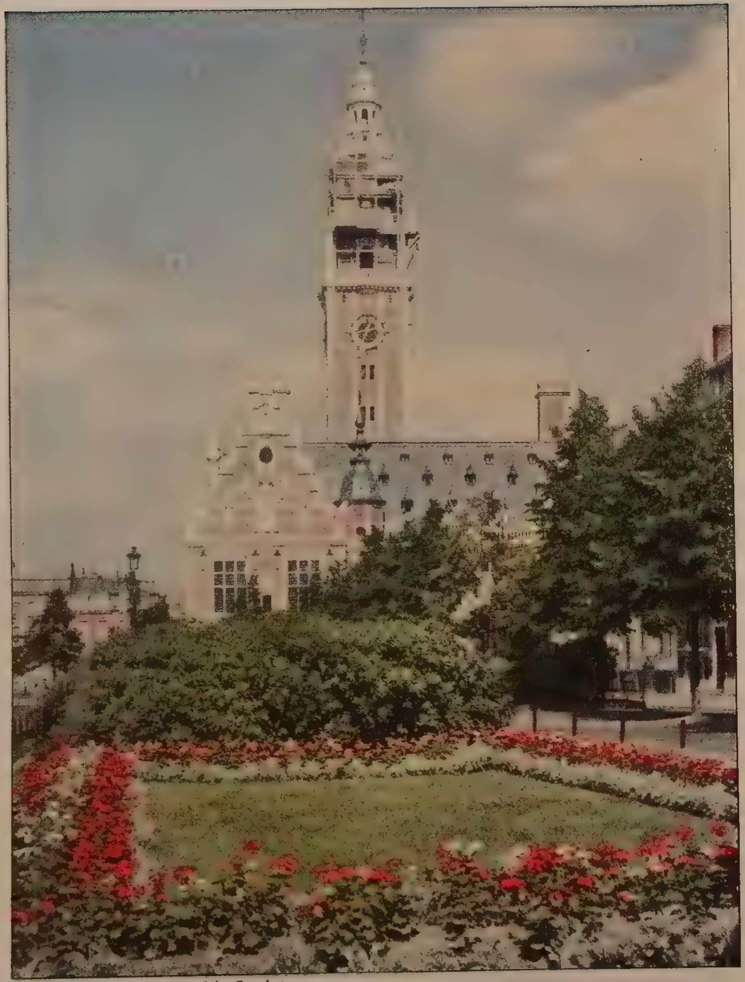
TRAGIC MEMORY LINGERS IN THE SENATE CHAMBER

It was in this room in the Palais de la Nation, Brussels, that a German court-martial condemned the heroic nurse, Edith Cavell. By the chair now draped with a black cloth (second row) she stood when she was sentenced. The high, carved seat in the third tier is that occupied by Crown Prince Leopold when he attends sessions of the Senate. Portraits of Belgian kings adorn the rear wall.



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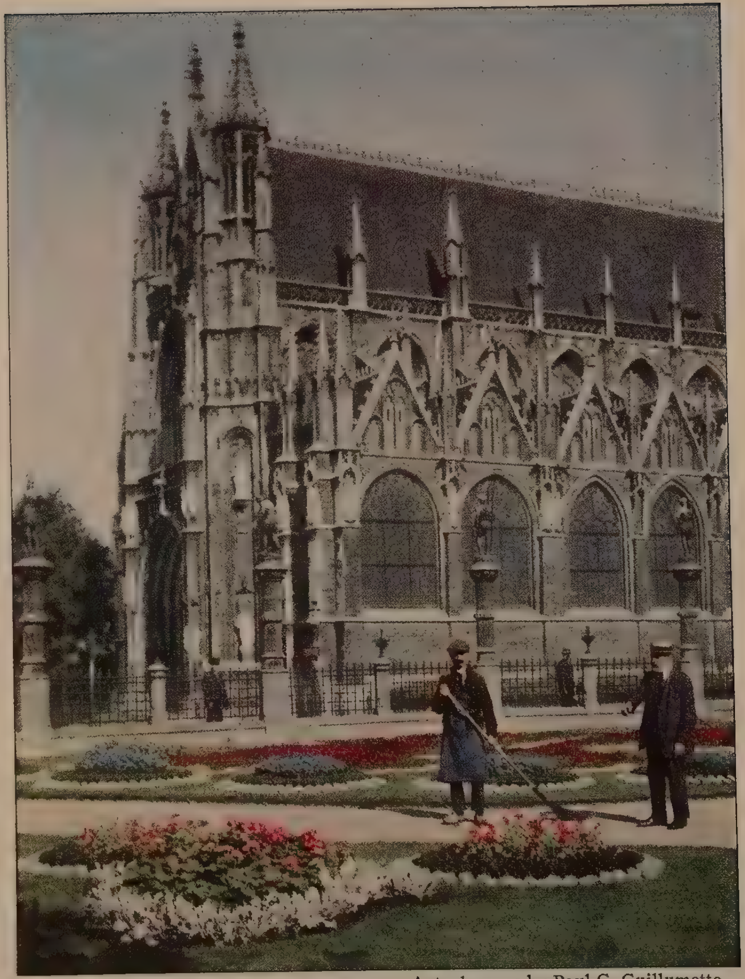
FROM WAR'S RUINS HAS RISEN A NEW TEMPLE OF BOOKS

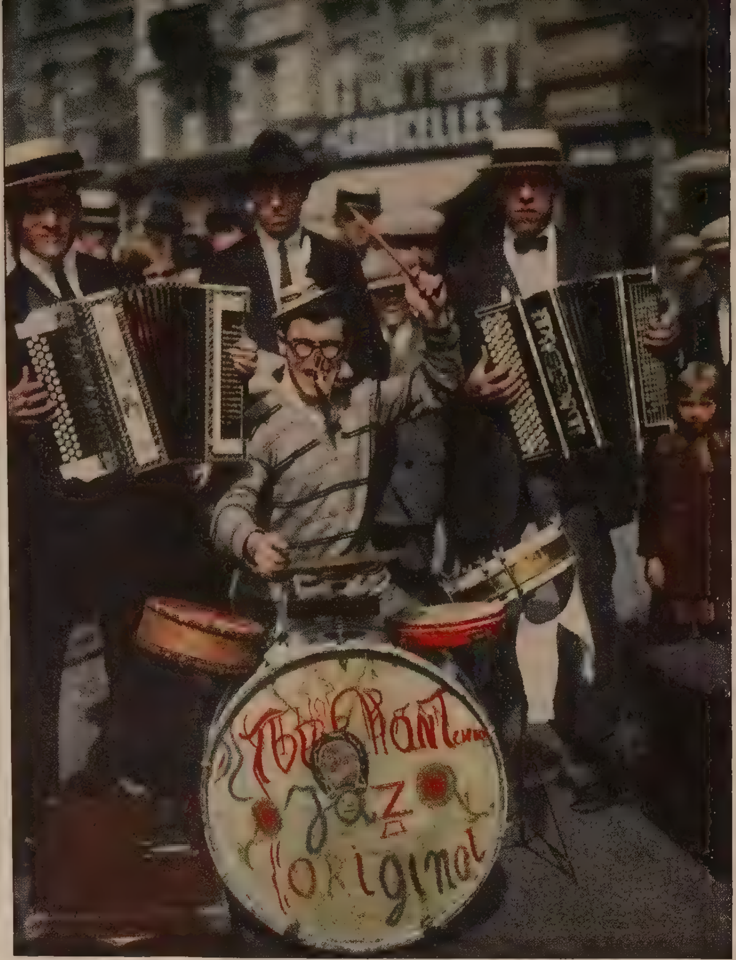
A disaster second only to the destruction of Reims Cathedral was the demolition during the World War of the University Library at Louvain, with its wealth of priceless manuscripts and 250,000 printed volumes. American gifts have made possible the new building shown here.



Autochromes by Paul G. Guillumette

GOTHIC GRACE CHARACTERIZES NOTRE DAME DU SABLON

This 15th century church in Brussels is notable for stained glass windows bearing ancient coats of arms. The poet Jean Baptiste Rousseau, who died in exile at Genette near by, is buried in the right transept. In the foreground is a part of the Place du Petit Sablon (see Color Plate XXIV).



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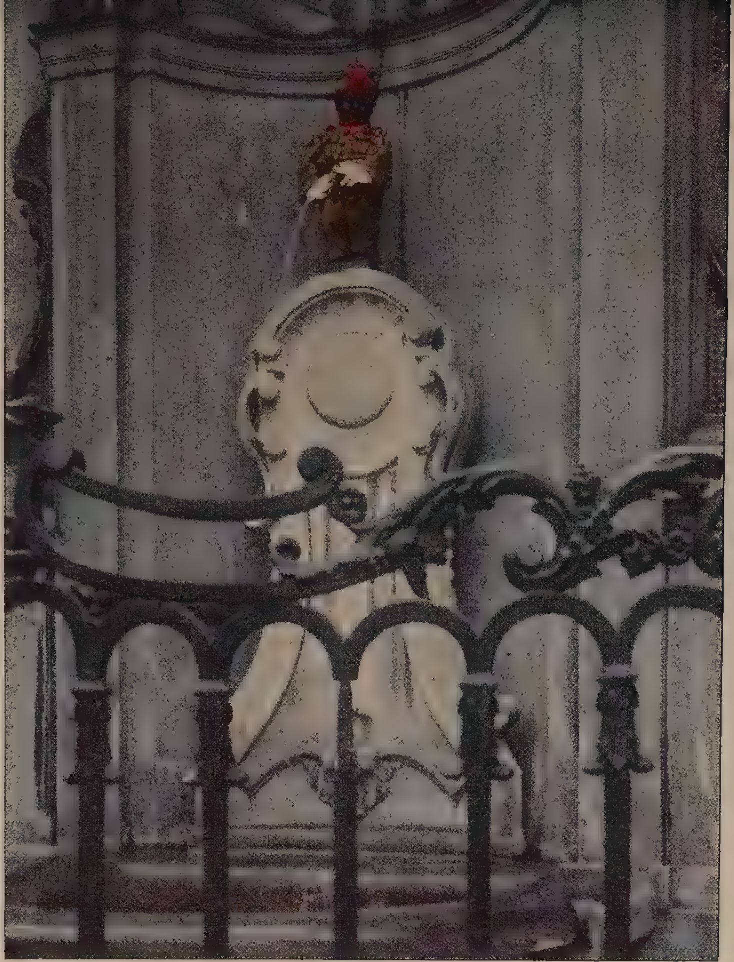
SONG "CLAQUERS" ARE MERRY FELLOWS

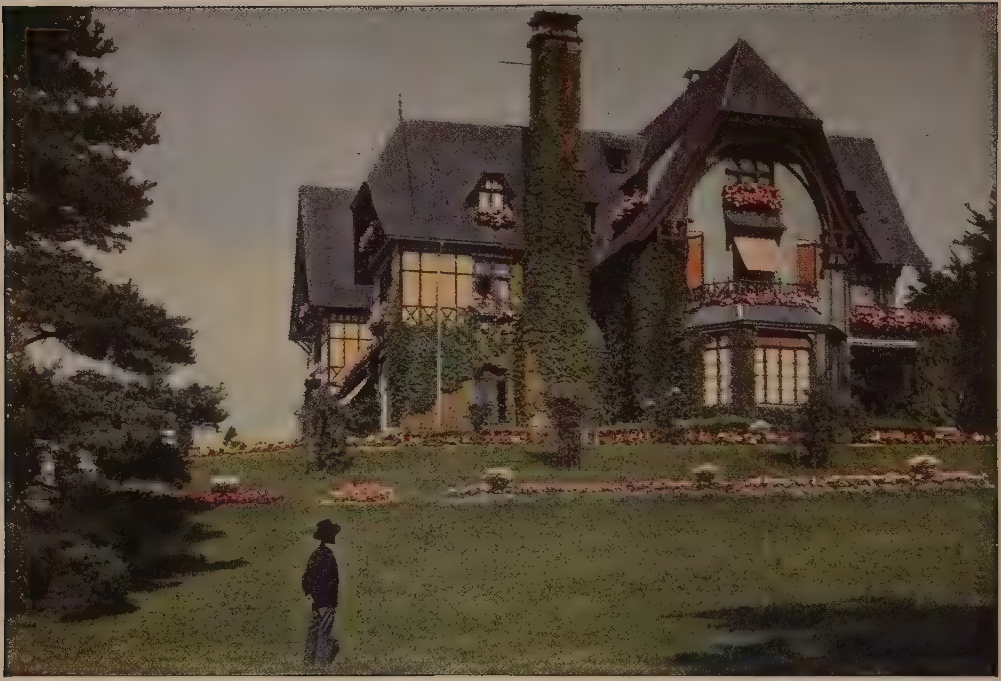
Wherever there is a crowd, these traveling street salesmen are to be found playing and singing popular airs and selling copies of the music at one or two francs each. The picture was taken on Place de la Constitution, opposite Gare du Midi, in Brussels.



Autochromes by Paul G. Guillumette

A STATUETTE WITH EIGHT SUITS OF CLOTHES

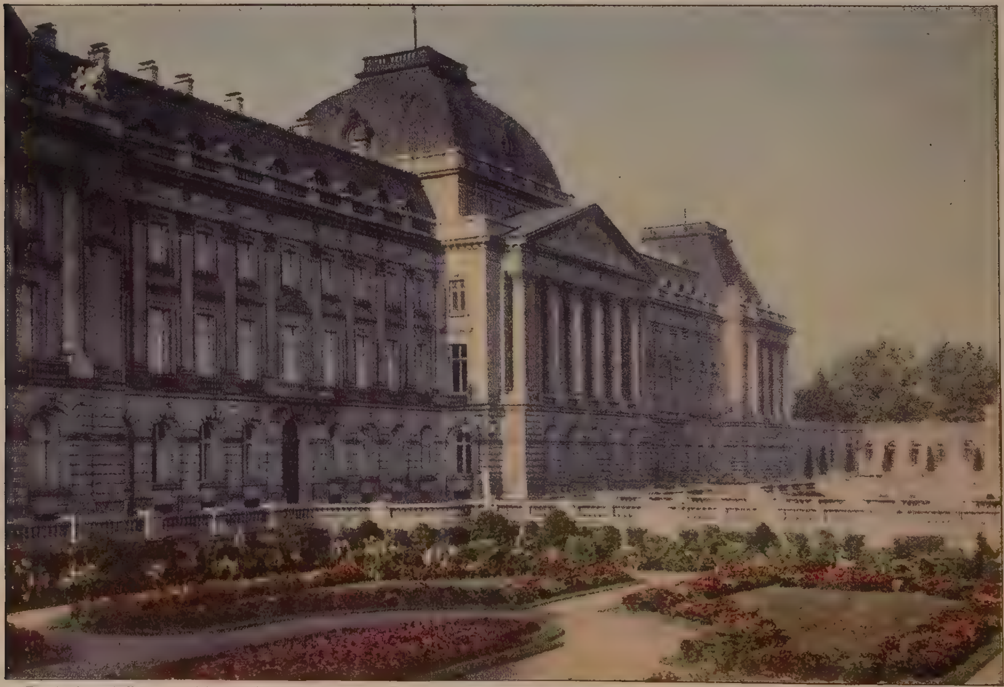
The bronze Manikin Fountain is called "the oldest citizen" of Brussels. He won a decoration and an embroidered coat from Louis XV, wore the red cap of liberty during the Revolution, received a chamberlain's key from Napoleon, and now affects the Belgian Guard uniform.



Autochrome by Paul G. Guillumette

WILHELM II LIVED HERE DURING THE LATTER PART OF THE WORLD WAR

Villa Neubois, near Spa, famous watering place of Belgium, was headquarters for the Kaiser for a time. It was from here that he fled into Holland on November 8, 1918, after the fateful interview with Von Hindenburg. Close to the house his private dugout for air raids is still intact and is shown to visitors.



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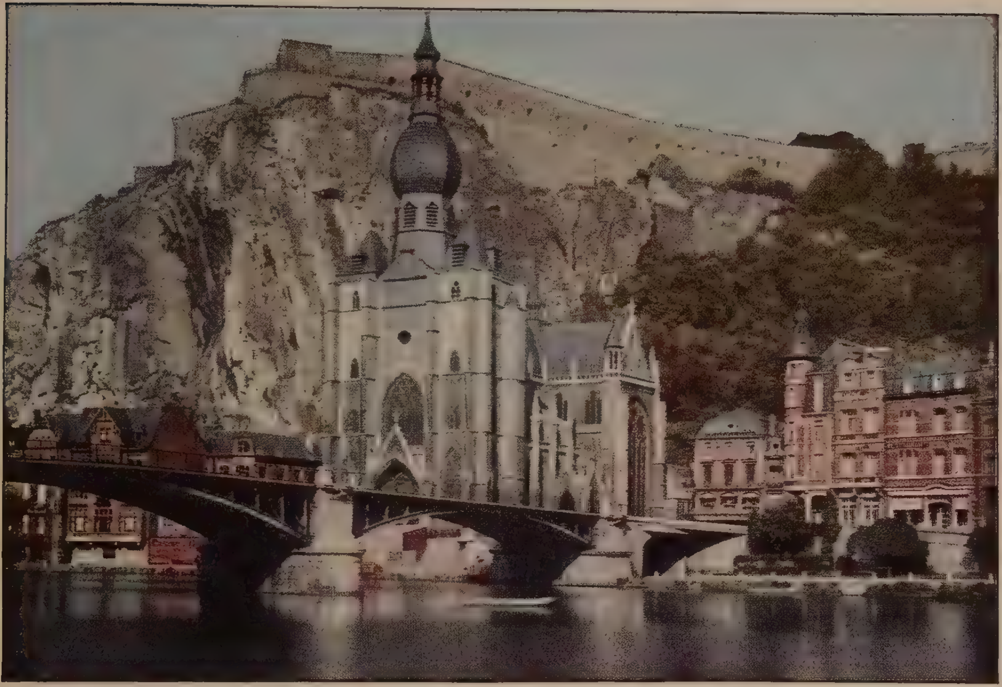
Autochrome by Prof. A. Buyssens

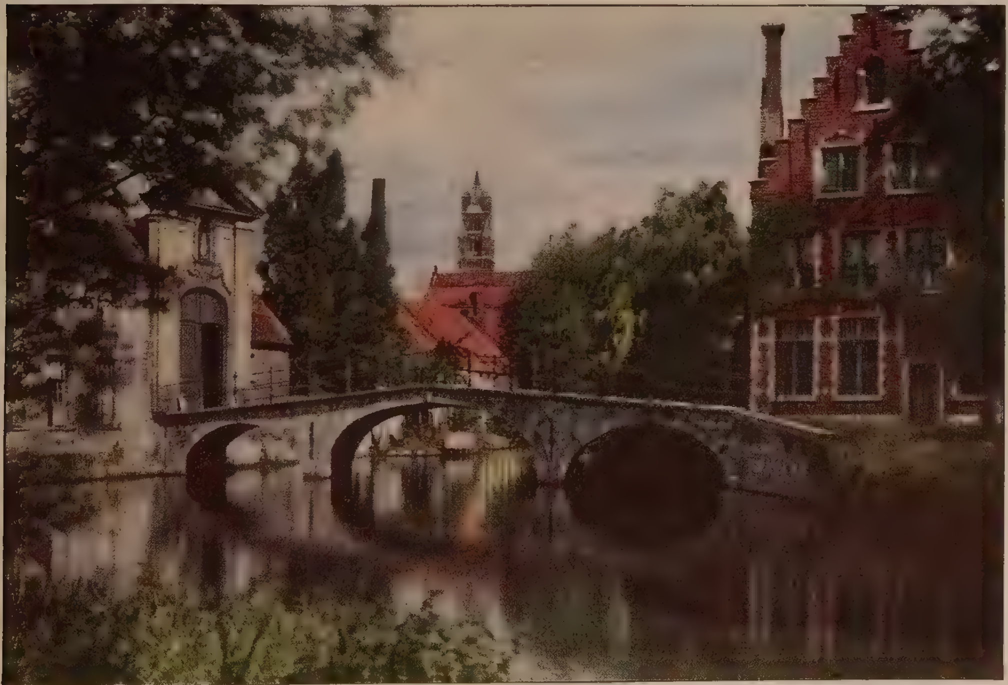
KING ALBERT'S HOME IN BRUSSELS

The massive Palais du Roi, dating from 1740 to 1827, was completely transformed in 1904-12. The interior, open to visitors in the absence of the royal family, is therefore somewhat lacking in historic interest.



DINANT'S COLLEGIATE CHURCH AND CITADEL WEATHERED WAR ATTACKS

Von Hausen, with his Saxon army, planted a flag on this fortified rock on August 15, 1914, but was repulsed, and it was six days later when he crossed the Meuse. Notre Dame, a 13th century Gothic edifice in gray stone and black marble, with its bulbous baroque spire, escaped serious damage.



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BRUGES, THOUGH CALLED "THE DEAD," LIVES IN ROMANCE

Looking along a placid canal spanned by one of the ancient bridges from which the city derived its name, the visitor sees at the left the entrance to the Béguinage Ste. Élisabeth, a medieval charitable association.

Autochrome by Paul G. Guillumette

EXQUISITE FLOWER BEDS BRIGHTEN THE PLACE DU PETIT SABLON

One of the loveliest nooks in Brussels is this resting place by the fountain memorial to the Counts Egmont and Horn, Belgian heroes, executed in 1588 by order of the Duke of Alva for revolt against Spanish oppression.

REAL LACE
DENTELLES

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Autochrome by Prof. A. Buyssens

BRUGES OF SONG AND STORY IS FAMOUS FOR ITS LACE

An artist's dream is this quaint old city with its winding streets and delightful shops where priceless bits of needle-point and other products of the Belgian woman's skill are on display in the windows. Fortunately modern progress has failed to spoil its romantic glamour.

OXFORD, MOTHER OF ANGLO-SAXON LEARNING

By E. John Long

"TAXI!"

This greeting, as I emerged from the Great Western Railway Station at Oxford, had a familiar ring; yet, on second thought, it sounded a bit strange, as it might have, for instance, in some obscure Italian hill town or in some inland Chinese city. "Cab, sir," it occurred to me, had been the only station salutation I had heard in England since I had been tendered ashore at Plymouth, a few weeks previously. And the panorama of spires I had just seen from the railway carriage window had settled me into a local, an Old English, so to speak, state of mind. The rest of the world had seemed far away—and then this echo of Times Square!

But the unfamiliar, un-English "Taxi!" was merely the modern Oxford cab driver's way of informing me that I had been recognized as an American, and that modern Oxford town is quite wide awake, thank you, and up and coming, sir, and, by your leave, ready to do your bidding.

"A round of the town, sir, and all the 'igh spots, sir, for ten bob—that is to say, sir, ten shillin's"—the cabby suggested, swinging open the cab door with a flourish. But I resisted the temptation to hear the quaint store of fancy and misinformation for which these unofficial guides are noted and gave him the address of the Wellington Square boarding house recommended to me in London at the American University Union.

THE AUTHOR BECOMES AN UNDERGRADUATE

As the honking cab threaded its way through the motors and bicycles of Hythe Bridge, Worcester Street, and Beaumont Street, passing now a new garage, now a group of medieval college buildings, now a mid-Victorian "private hotel," it occurred to me that this taxicab driver had unwittingly given me a key whereby I might reach a better understanding of this city of unexpected contrasts and charming inconsistencies; this Oxford, where medievalism and modernism are so inextricably mixed.

I had come to Oxford to do research work in English and in history for a book I intended to write. I must also confess that my choice of Oxford was the gratification of an ambition of several years to attend some of the lectures delivered by Oxford professors whose fame had reached across the Atlantic.

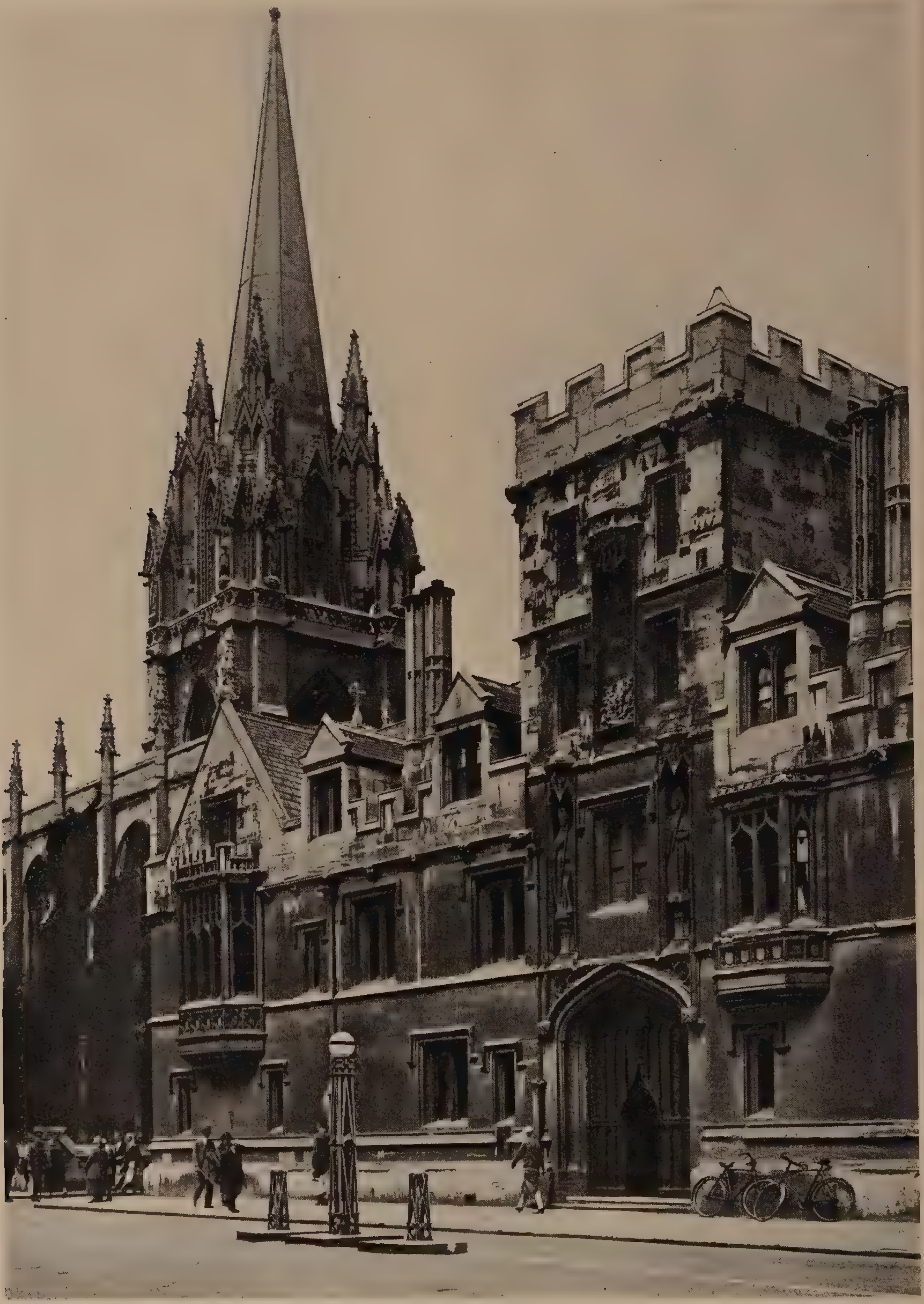
At the American University Union in London I was advised that the best way to obtain the full resources of the university was to apply for membership as an undergraduate. I would thus be subjected to the discipline of the university as an undergraduate, but I would be free from the necessity and embarrassment of obtaining special permits and from establishing my status as a free-lance student.

I was told that all the colleges were full for the term, but that I might be admitted as a member of the Delegacy of Non-Collegiate Students, an Oxford group not associated with any college foundation, but one whose members are entitled to the same general privileges and subject to the same discipline.

Armed with letters of introduction and a copy of my grades at Columbia University, I called at the Delegacy of Non-Collegiate Students, and, after explaining my purpose in coming to Oxford, I was told to report in the library of the Delegacy, a few days later, in cap and gown, which I must purchase. I was further advised to wear a dark suit, black preferred, and a white necktie and bow collar. This, I was informed, is "subfusc," the official uniform for all formal university occasions, such as matriculation, graduation, or calls upon the chancellor or the proctors.

A "BEHAVE YOURSELVES" ADDRESS IN LATIN

When I, and the others who had been accepted for admission, had assembled in the library at the appointed time the Censor, as the dean of Non-Collegiate Students is termed at Oxford, made a short speech. He said we would presently march in a body to the Divinity School, where the vice chancellor would receive us into the university.



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ST. MARY'S SPIRE RISES BEYOND THE MAIN FRONT OF ALL SOULS COLLEGE

History and the law are subjects of special emphasis at All Souls. The college is well endowed and is devoted almost entirely to graduate and research work (see, also, illustrations, pages 580 and 585).

© Oxford Journal

PREPARING THE BOAR'S HEAD FOR THE CHRISTMAS FEAST AT QUEEN'S COLLEGE

To the accompaniment of a quaint English and Latin carol, a boar's head on a huge silver platter is carried from the kitchen to the High Table, where heads of the college sit. This annual occasion is reputed to commemorate the valorous achievement of one of the early students. According to legend, the student, while walking in the forest and reading Aristotle, was suddenly attacked by a wild boar. Undaunted, he thrust his book into the animal's mouth and effectively "choked off" his adversary by this practical application of the arguments of the Stagirite.

"The vice chancellor will make a short address in Latin," the Censor explained, "the substance of which will be 'behave yourselves,' and to which you need make no reply. When your names are called, come forward and he will present each of you with a certificate of matriculation. From this time you are members of the university and subject to its regulations and discipline."

The Censor returned to his study, but in a few minutes he came out again, wearing the scarlet hood over his gown, which signified that he possessed the degree of Master of Arts of the university. We followed him, a small parade of undergraduates and instructors, along several streets and across several courts, to an ancient stone building adjoining a large paved quadrangle. We entered a long hall with seats like pews on each side and overhung with a magnificent arched roof of delicate stone tracery. Groups of scholars and instructors from other colleges were already there.

We had not long to wait. Despite its air of medieval repose, Oxford conducts its affairs with precision and, considering some of its antiquated systems, with surprising efficiency.

The vice chancellor, in a resplendent scarlet robe and cap with gold tassel, entered the room, preceded by two beadles in black cap and gown. The office of bedel is "an ancient and honorable one." Formerly they were appointed to punish petty offenders, but their duties now are chiefly processional. On all formal university occasions the bedels precede the vice chancellor, bearing their staves, three gold and one silver.

After the vice chancellor had delivered his admonition-benediction, our names were called in Latin by one of the assistants, and we stepped forward in turn to receive a small paper scroll and a bound copy of the university regulations from the hand of the vice chancellor. It was quickly done. He did not look up as he issued mine. My scroll read:

> Oxoniae, Termino Michaelis A. D. 1926.
> Die XIX, Mensis Oct.
>
> Quo die comparuit coram me Edwardus Joannes Long, Schol. non Ascript. et admonitus est de observandis Statutis hujus Universitatis, et in Matriculam Universitatis relatus est.
>
> Francis W. Pember, (signed)
> *Vice-Cancellarius.*

It was a simple ceremony, but most impressive. It gave the effect of a contract entered into, both parties assuming duties and obligations; yet, at the same time, the elements of the dramatic took away the sharpness associated with contracts. I felt that I had been properly initiated into some order of learning, some mystic cult of pansophy whose age-old secrets were now about to be revealed to me. It was so much more effective than visiting a bursar's office and paying fees, although this rite, too, had to be performed in due time at Oxford!

THE PRIVILEGES OF A UNIVERSITY STUDENT

I was now a member of the university. I could attend lectures without the payment of extra fees and use without question the great wellheads of information the university afforded.

Several days remained before lectures would start and, with so much new and interesting on every hand, I decided that research work, too, could wait. The spirit of Ulysses is said to be foreign to the true Oxonian, but I wanted to know this place in which I was to live and work for the next few months. I spent most of the daylight hours browsing from college to college and most of the evenings reading about the Oxford that has been.

For Oxford is a picture of the Middle Ages, whose spirit speaks of to-morrow, and is a fascinating study in itself. "A home of lost causes and impossible loyalties," it has been labeled by some writers. Perhaps libeled is a better word. "Lost causes" and "impossible loyalties" suggest defeat and decay. But Oxford apparently has been nourished by lost causes; it has thrived on, or prospered in spite of, impossible loyalties (see, also, page 595).

The spires of the good gray city look down upon us restless ones of a machine age with the same detachment and indifference that they displayed in the face of Cromwell and his Roundheads or any others who have threatened their monastic peace and calm.

There are, of course, those who say that Oxford is very far from being a home of lost causes, and that, on the contrary, it has always been quick to fall in line with every popular fad which various generations have developed. But this is a matter of opinion.

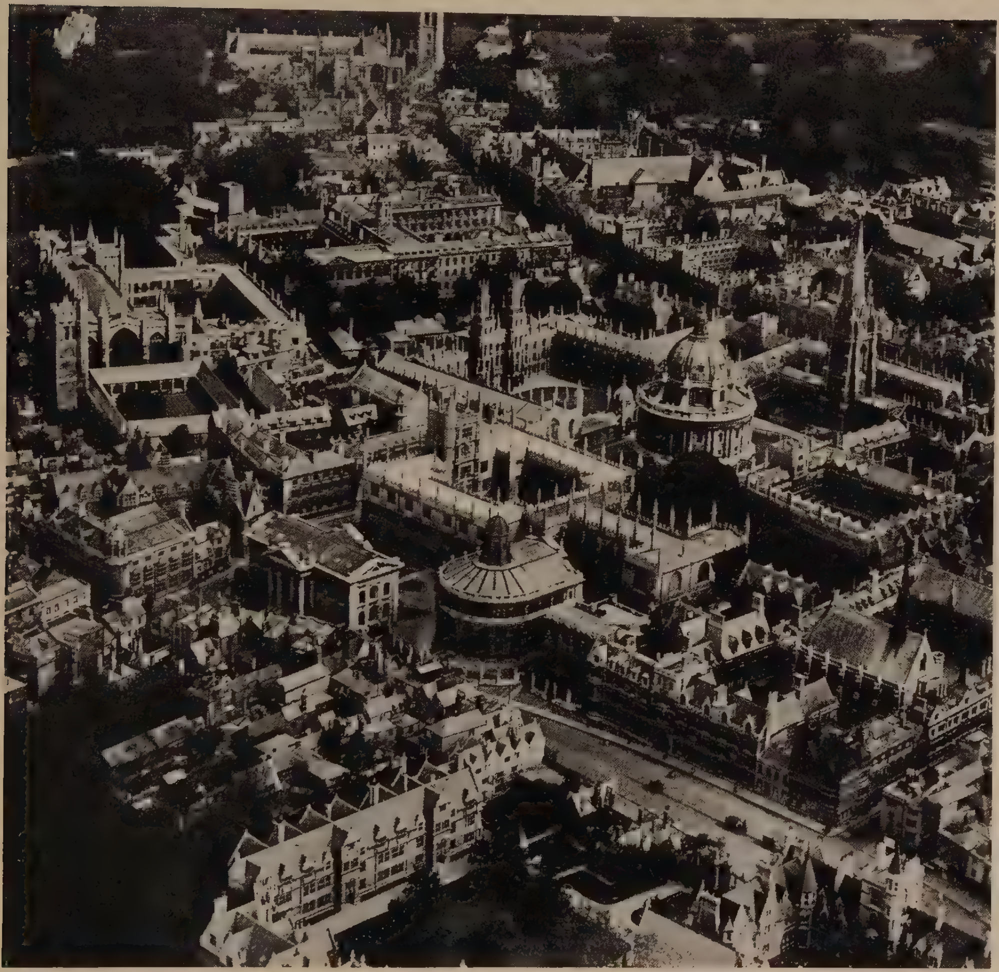
News that a great automobile factory at Cowley village, on the outskirts of Oxford, is likely to convert the venerable seat of learning into a second Detroit is met in Oxford with mild surprise and a puzzled frown.

"Just where is Cowley," the typical Oxonian will ask, although he may know well enough its disreputable and formerly popular motion-picture house, and the Morris automobile factory there, largest in Britain. "And what can an automobile factory hope to produce which can rival these?" indicating a row of beautifully illuminated manuscripts in that treasure storehouse of the mind, the Bodleian Library. Nevertheless, an Oxford Preservation Trust has recently been organized to assure the manuscripts at least an even break if "progress" should get the upper hand.

CONCESSIONS TO PROGRESS

Strolling along the winding streets and lanes of Oxford town, I noticed many things in the windows and signs of the shops which indicate that the tradesmen and others not directly connected with the university have made concessions to the times—chain stores, called "3 and 6's" instead of "5 and 10's," the units being pennies. There is a branch of the well-known Woolworth's in Oxford; American movie houses, "cinema" is the English word, showing American and foreign films; interurban bus lines, garages and parking spaces, soda fountains, and novelty shops.

Although every vista is closed with a spire or tower, a polite and efficient traffic policeman will admonish you to "come along" (move), if you linger too long at



Photograph from "Topical" © Aërofilms

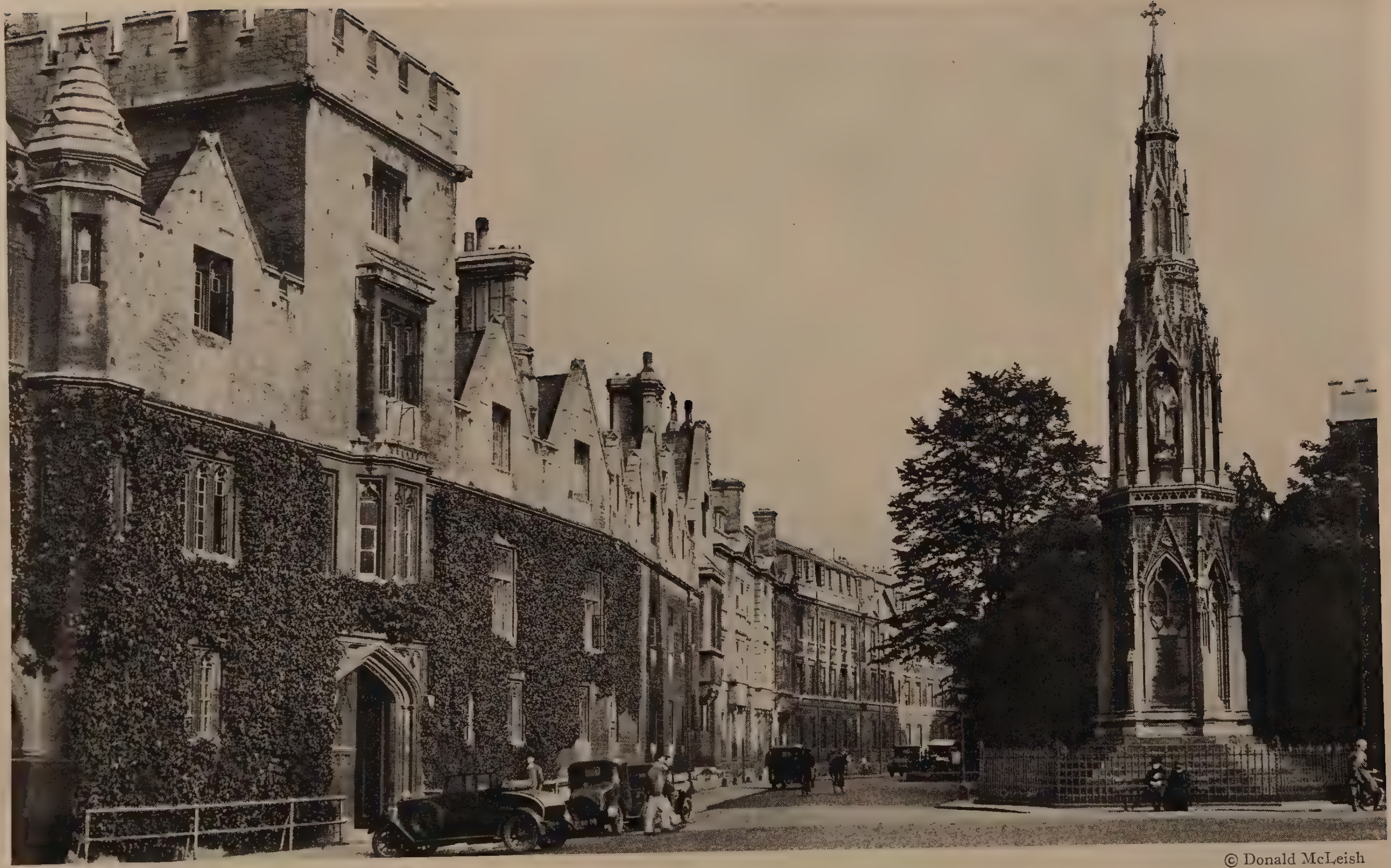
AN AIR VIEW OF THE MOTHER OF ANGLO-SAXON LEARNING

In the center is the Divinity School, flanked on the right by the dome of Radcliffe Camera and the Spire of St. Mary the Virgin and on the left by the columned Clarendon Building. The Brasenose quadrangles are to the right and below the Camera, while the cross-shaped Bodleian Library and cupola-topped Sheldonian Theater are prominent in the middle foreground, with the buildings of Exeter College abutting the latter. In the middle distance are the twin towers of All Souls, with Hertford and New Colleges to their left, Queen's just beyond, and University to the right (across High Street). Magdalen's incomparable tower rises above the college buildings, at the top of the picture. In the lower left are parts of Trinity and Balliol.

crossings to drink in the beauty and charm of the scene before you.

But all this is Oxford town, which for generations has washed like a sea against the bulwark of walls, towers, and battlements known as the colleges of Oxford University. Within their great iron-studded gates the noise, the ephemeral comings and goings, the ordinary pleasures and triumphs and disappointments of the workaday world fade away.

These quiet quadrangles, with their emerald carpets of velvety grass and bordering rows of brilliant flowers, belong, I felt, to the ages. Their leaded glass windows, looking down from ivy-clad towers and walls whose edges have been softened in kindly decay, reveal glimpses of cozy dens which have listened to the wit and wisdom, the folly and roguery, the hopes and illusions, of seven centuries of a nation's finest manhood.



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A MONUMENT TO MARTYRED CHURCHMEN FACES BALLIOL COLLEGE

At Oxford, Ridley, Latimer, and Cranmer were tried for heresy and put to the stake in the middle of the 16th century. Their memorial was erected opposite the west front of Balliol College in 1841 and was designed by Sir Gilbert Scott after the beautiful crosses which the first Edward raised to the memory of Queen Eleanor. Balliol College was founded in 1265 by that John Baliol whose son was for a short time King of Scotland.

OXFORD UNDERGRADUATES ENGAGED IN A FAST GAME OF HOCKEY

Photographs by Topical Press Agency

JUBILANT SUPPORTERS OF A BRASENOSE CREW GO INTO THE RIVER TO WELCOME THEIR VICTORIOUS EIGHT

In general, Englishmen are not supposed to become greatly excited about their sports, but rowing races offer an exception to the rule. In the heat of a contest on the river all reserve is cast aside.

Photograph from E. John Long

SCORING A "BUMP" IN A "TORPID" RACE ON THE ISIS

To bump the boat in front, and thereby advance one place on the river, is the object of each college shell. The "Torpid" races are preliminary to those of Eights Week and are rowed in heavier boats with fixed seats (see text, page 595).

Here, one feels sure, is no shell of a dead civilization, but rather the rich fruit of ripe old age; a maturity secure against whatever may come or go in the world outside, be it near or far from the gates.

THE ORIGIN OF THE UNIVERSITY IS SHROUDED IN MYTH

The origin of Oxford as a university is shrouded in the misty myths of a day when records were poorly kept and even more poorly preserved. Some authorities hold that Oxford and Cambridge were each founded by early potentates. Others claim that religious establishments in the towns attracted scholars.

It seems more likely, however, that both Oxford and Cambridge became universities as a result of location and a series of fortunate circumstances. Halfway between London and the Midlands of England, on main routes connecting the two populous districts, yet far enough removed from the disturbances of these industrial and political centers, teachers and scholars alike found in them havens for academic life. A few learned men gathered about them, in their homes or in monastic buildings, groups of students, who found such accommodations as they could in halls or hostels about the town.

In course of time the scholars and teachers, as a matter of convenience, boarded together in halls. Gradually these halls gave way to corporate bodies or colleges, most of them of religious foundation and endowment. Expulsion of foreign students from Paris in the 12th century proved a great impetus to the struggling little English groups, and we find, a century later, that Oxford has 3,000 students, and that Cambridge is recognized, in a writ of Henry III, as "an important seat of learning."

To-day Oxford is officially composed of 21 colleges, one hall, a Delegacy of Non-Collegiate Students, four "societies" or colleges of women students, and the Society of Oxford Home Students, the last the female equivalent of the Delegacy of Non-Collegiate Students. In all, there are some 15,000 undergraduate and grad-

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SIR WALTER RALEIGH CLAIMED ORIEL AS HIS ALMA MATER

This college was founded by Edward II in 1326, but the present buildings are of much later date. Over the hexagonal portico are statues of the founder and of Charles I, while in a niche above them is one of the Virgin and Child.

uate members of the university, of which from 4,000 to 5,000 are undergraduates in residence.

THE UNIVERSITY ELECTS TWO MEMBERS OF PARLIAMENT

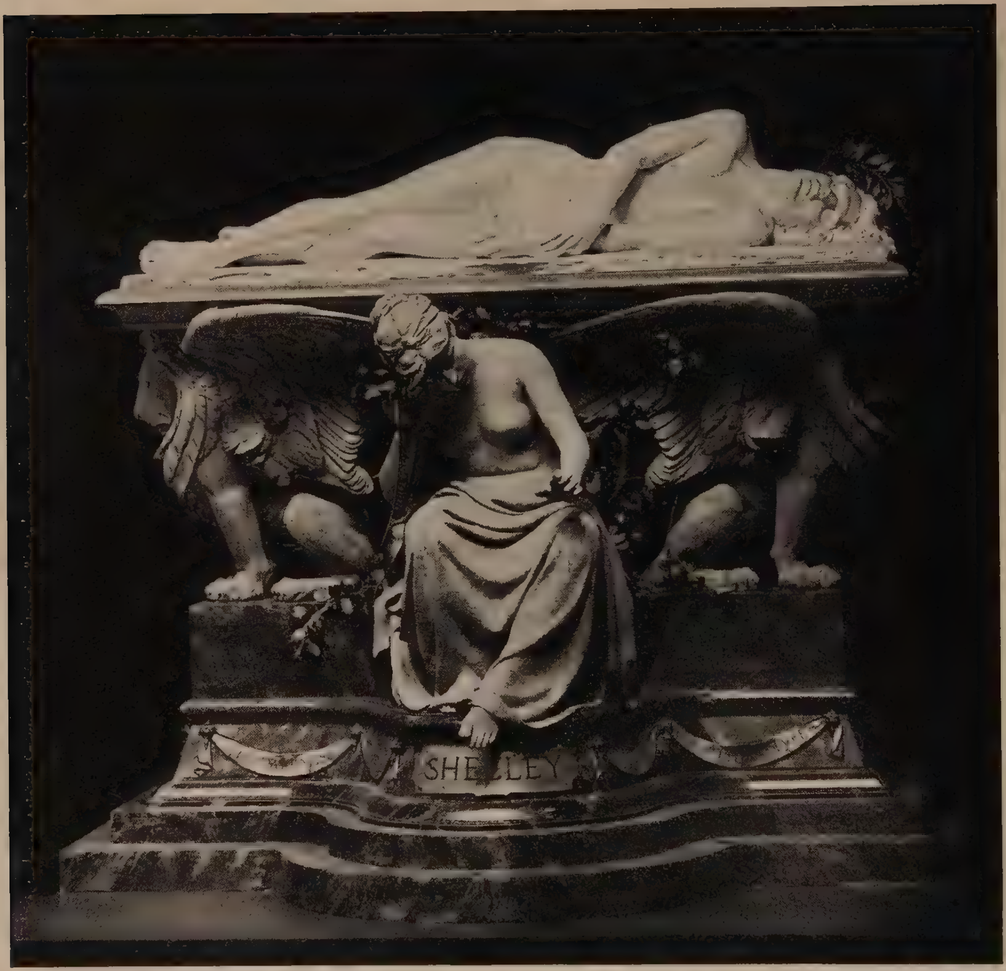
Graduates may continue to be "members" of the university by the annual payment of certain fees. This membership carries with it both academic and political rights. If the graduate has a degree of Master of Arts or higher, he may vote on all proposed university legislation, and, if he is also a British subject, he may take part in the election of the two members of Parliament to which the university, as distinct from the town and county of Oxford, is entitled.

Oxford and Cambridge are unique among institutions of higher learning in the world in that they are composed of colleges which are also incorporated bodies, each college with independent endowments, the right to receive and reject whom it will, and the power to regulate its students, within the walls of the college itself, as it sees fit. No one, in fact, may be a "member" of the university unless he is first accepted by one of the colleges or the "societies" of which the university is composed. There are no members of the university "at large."

The university regulates the teaching, prescribes the requirements for degrees and grants them, and enforces discipline outside of the college walls. Almost every other power is delegated to the individual colleges. In some respects the relation between the university and its colleges resembles that between the Federal Government and the State governments of our own country.

When all this had become fairly clear in my mind, I learned that there are many exceptions; that Oxford is replete with what seemed, to my order-loving, pigeonholing, American way of looking at things, strange inconsistencies.

I discovered, too, that the university policed quite rigidly my actions outside of my lecture room or my "diggings," as living quarters in town are called. There



Photograph by Davis

ONE OF THE LIONS OF UNIVERSITY COLLEGE IS THE SHELLEY MEMORIAL

Executed by Onslow Ford and presented by Lady Shelley, this memorial precipitates heated artistic discussions in Oxford. In 1810 the poet had rooms in the college, but was expelled for publishing his pamphlet, "The Necessity of Atheism."

were many places I might not visit. Saloons, or public houses, as they are termed, were tabu, although there was no stated limit to the amount of intoxicant I or any other undergraduate might consume in a college or a lodging or at certain restaurants approved by statute.

"A FREE CITY WHEREIN MEN ARE SLAVES"

This does not mean that drunkenness goes unreproved in Oxford. It does not, but there is some leeway about drinking. Instructors are often present at dinner parties where the cup that cheers passes freely. Ale may be obtained at meals in the college halls.

My relations with the fair sex, I was told, would be subject to careful supervision, more so than at any American university. Undergraduates are sometimes stopped on the street by a university officer, who requests an introduction to their companions, "to make certain that relations are all that could be wished."

Englishmen accept all this as a matter of course, but American students sometimes protest that their constitutional rights are being infringed, forgetting that they are guests in a strange land which has no constitution, in our sense of the word, but which guards the rights of freemen, after its own code, as well as any.

SAFETY
BLADES
Sharpened
Here.
1/- Doz.
Machine

Photograph by Clifton Adams

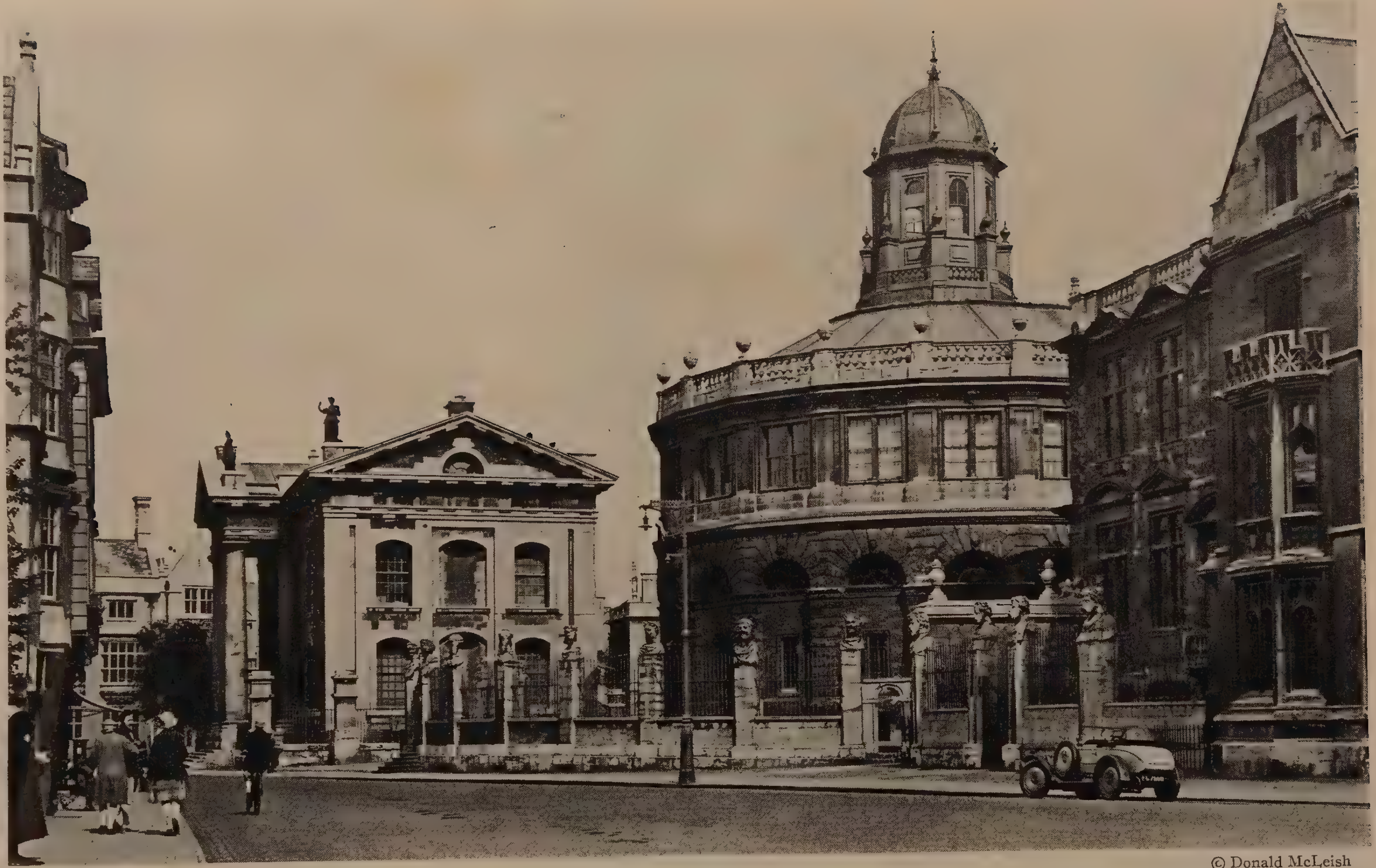
PARCEL POST TRAVELS ABOUT OXFORD IN A RED WICKER PUSHCART

A postman from the local office out on the streets with his parcel-post barrow delivering packages. Almost all the machinery of His Majesty's mail is painted red.

In the copy of Statuta et Decreta, which is presented to him when he is admitted *in statu pupillari* by the vice chancellor, the newcomer will be informed that two proctors, appointed from college faculties, and two servants (popularly known as "bulldogs") are empowered to enforce the rules and regulations of the university throughout the Oxford district. They patrol the streets of the city of Oxford and take the names of undergraduates who may be found in places forbidden in the statutes or those being disorderly or otherwise conducting themselves in a manner "not befitting a member of the university."

One English writer comments facetiously on the system: "In solemn truth it may be said that the Common Law of England, which covers so great a part of the world, even beyond the bounds of the British Empire, does not run in Oxford. Oxford is a free city wherein men are slaves of a chancellorial tyrant."

This is, of course, mere hyperbole. But the vice chancellor, who does the work of the chancellor, an honorary, nonresident officer, may truly be said to be the lord of all he surveys in Oxford. While the city of Oxford has a ruling mayor and corporation (council) and theoretically is independent and supreme outside of



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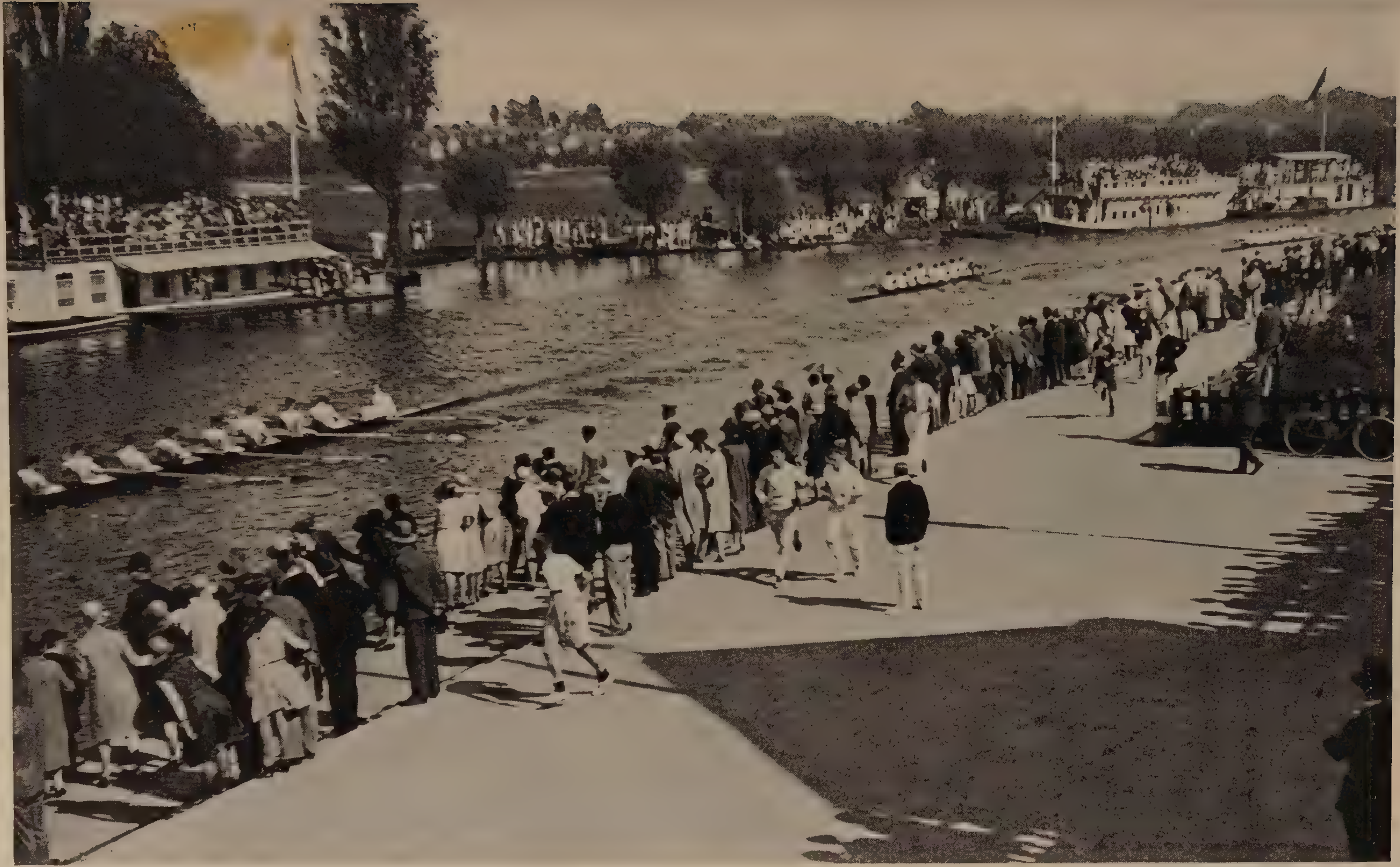
THE CLARENDON BUILDING AND SHELDONIAN THEATER ARE IMPORTANT COGS IN THE UNIVERSITY LIFE

In the former (at the left) are located the offices of many of the university officials. The latter (center) was designed by Sir Christopher Wren and is used for commemoration exercises, when prize poems and essays are read and degrees conferred. At the right a corner of the old Ashmolean Museum shows. In this building the great Oxford Dictionary, or, as it is now called, the "New English Dictionary," was completed (see text, page 588).



Photograph by Topical Press Agency

SUMMER EIGHTS PROVIDE THE CLIMAX FOR SPORTING EVENTS AT OXFORD

Competition in these races is intercollegiate and produces greater enthusiasm than any other event of the school year. To be a member of the college eight is the height of the undergraduate athlete's ambition (see text, page 592).

Photograph by Topical Press Agency

ENGLISH FOOTBALL AFFORDS PLENTY OF ACTION

The game as played at Oxford differs considerably from the American sport. It is a pastime of long standing and ranks with cricket and rowing as one of the most popular British sports. To be a "blue," or first-team man, at "rugger" is almost as great an achievement in the university as to row on a varsity crew.

college walls, it usually gives way when the vice chancellor of the university wishes certain things.

For instance, no dances, benefit entertainments, or other amusements open to the general public and students may be held within the limits of the city of Oxford unless the permission of the vice chancellor has first been obtained. On the advertisements and programs for such entertainments will always be found the significant line: "By permission of the Vice Chancellor and the Rev. the Right Worshipful the Mayor."

Yet there is an exception to this rule of rules. Within the walls of a college the vice chancellor has not an atom of authority. He may only request "Heads of Houses" (the principal of a college is known by various titles: he is Dean at Christ Church; the Master at Balliol, Pembroke, and University Colleges; the Rector at Exeter and Lincoln; the Warden at New; the President at Magdalen; the Censor at the Delegacy of Non-Collegiate Students, etc.) to comply with his wishes, even if an undergraduate within the college walls is wanted at the Chancellor's Court for a misdemeanor.

CAUGHT BY THE PROCTORS

Thus, perhaps, is best illustrated the real significance of the college at Oxford, and thus, in a measure, is explained the bewilderment of the summer tourist who tramps from college to college in search of the university, always so difficult a thing to find at Oxford!

The proctors, as enforcement officers, have a method of their own in apprehending rule-breakers and in dispensing justice. It combines strictness with the utmost tact and courtesy. In the course of my own experience at Oxford I was "progged" (caught by the proctors) for an offense I had not committed, but I am glad the incident occurred, for it revealed most graphically the workings of the university legal system.

With another student I had been walking along Cornmarket Street early in the evening. My friend stepped into a pharmacy and I walked on a short distance, finally stopping to wait for him. I did not notice that I had halted in front of an unlicensed (not listed in the permitted places in the Statuta) dance hall. Just then the proctors, in flowing cap and gown, and the two bulldogs, or "bullers," came up the street (see page 573).

Then was my time to flee, for the hard heels of the bulldogs pounding on the pavement usually give miscreants a very sporting warning and a chance to get away.

But my conscience was clear. I watched the "parade" with some interest, wondering what luckless wretches would be caught "in the toils" that night, when, to my astonishment, the senior proctor stepped up to me.

"Your name and college, sir," he requested, drawing a pad and pencil from his pocket. I should say here that I had been recognized as an undergraduate because I had my gown with me. University regulations require the undergraduate always to have his gown when he appears on the street at night, although he does not have to wear it as long as it is visible; that is to say, he may drape it over his shoulder, or over his arm, or wear it like a scarf around his neck. It must be worn in lecture halls, although mortar boards do not have to be worn either on the streets or in classes.

For a moment I was dumfounded.

"But . . . but, what for?" was the only thing I could stammer.

"Your name and college, sir," the senior proctor insisted in the same polite tone. The two bulldogs towered menacingly. They are chosen for their fleetness of foot, so there would have been little use in making a "break" for it. Besides, they would surely have grabbed one of the long black tassels of my gown (which Oxford tradition says were provided for this purpose) and yanked it off. My name was sewed in the collar!

But I didn't want to run. I felt I hadn't done anything. There was a mistake somewhere.

"What is my offense, sir?" I asked.

But there was little use to protest or

Photograph by Ewing Galloway

A VENERABLE SUNDIAL FACES THE BRASENOSE QUAD

The odd name of the college is probably derived from an ancient brass knocker, a lion's head, on the old hall. It was carried away in the 14th century and only returned to the college in 1890.

Photograph by Gillman

FOLLOWING THE HOUNDS IS A FAVORITE SPORT AMONG OXONIANS

Fox hunting behind a baying pack or pursuing hares afoot with beagle hounds provides both fun and exercise for young sportsmen. When driven from its home the hunted animal runs in great circles about the countryside and frequently returns to its starting point. However, the dogs often switch to a new quarry several times in the course of a chase, with the result that their intended victim sometimes gets away.

expostulate, or to assume an air of injured innocence. I knew well enough that such matters are not discussed on the streets; so I gave the proctor the information he desired. Then, with an equally polite "Thank you," a tipping of the mortar boards, and a little bow, the cavalcade moved on.

The next day I received a brief note requesting my presence before the proctors "precisely" at a certain hour and date.

THE TRIAL AND ACQUITTAL

And I had to go. Not even resignation from the university would have absolved me from this duty, for the university court has equal jurisdiction with all other courts of the realm. Its summons must be obeyed by all. In fact, any local case, except those relating to freehold, in which one party is a member of the university may be taken out of other courts and tried in that of the university, if the vice chancellor sees fit to exercise this right. An "undesirable" person may be banished from the city of Oxford by the vice chancellor's court.

In cap and gown, I appeared at the appointed time in the Clarendon Building, where petty cases such as this are heard. The two proctors were seated behind a table. There was also a court clerk.

The senior proctor tipped his mortar board to me when I entered the room. I removed my cap.

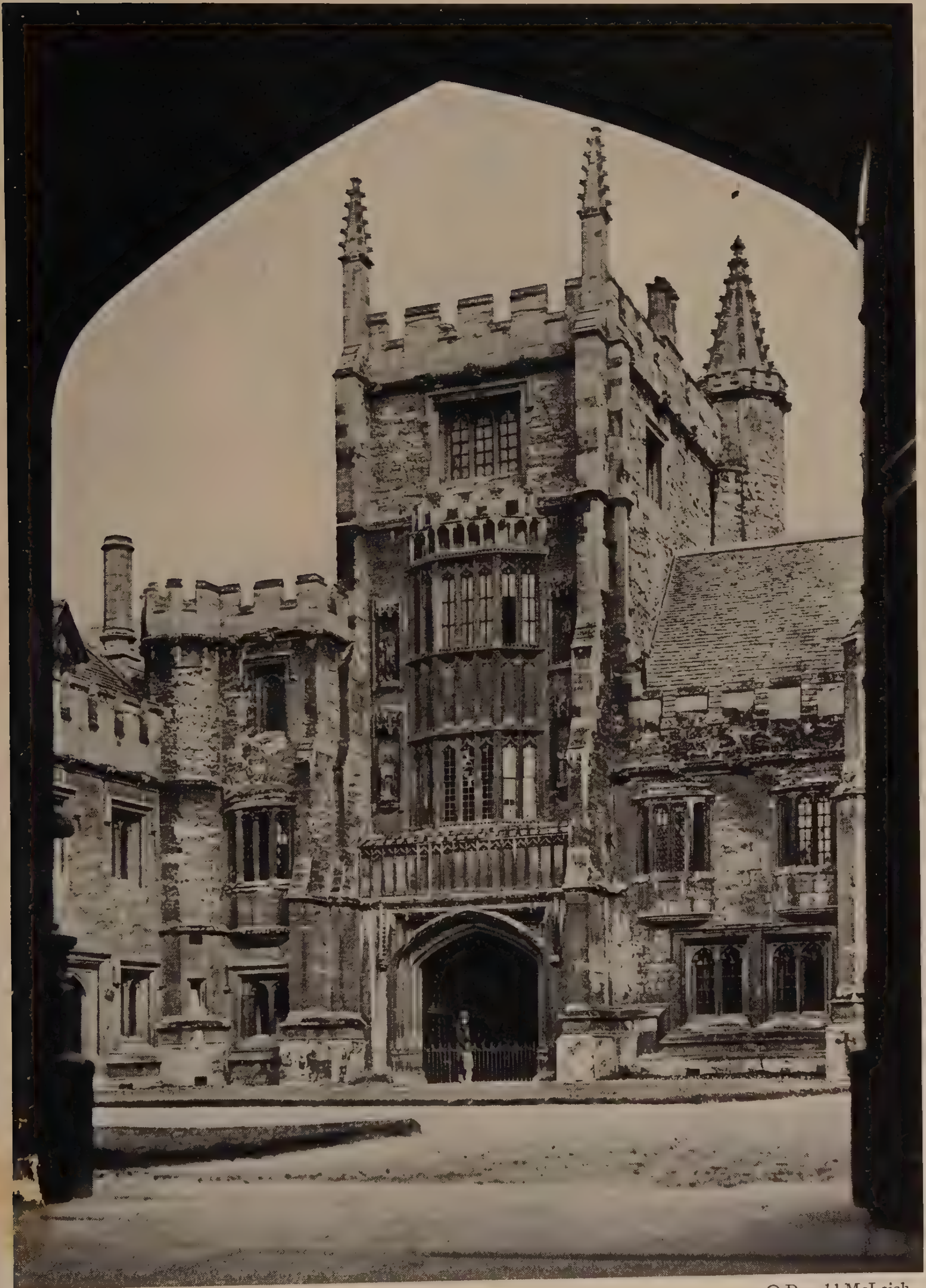
"Mr. Long, you were seen apparently coming out of an unlicensed dance hall on Cornmarket Street two evenings ago. Is there anything you wish to say?" the senior proctor began.

I replied that I had not been in the dance hall.

"Mr. Long, did you contemplate a visit to this unlicensed dance hall?" he asked.

I answered that I had not; that I was not aware that I was standing before the place, and that I had halted only to wait for another undergraduate accompanying me.

"Very good, sir. That will be all. Oh,



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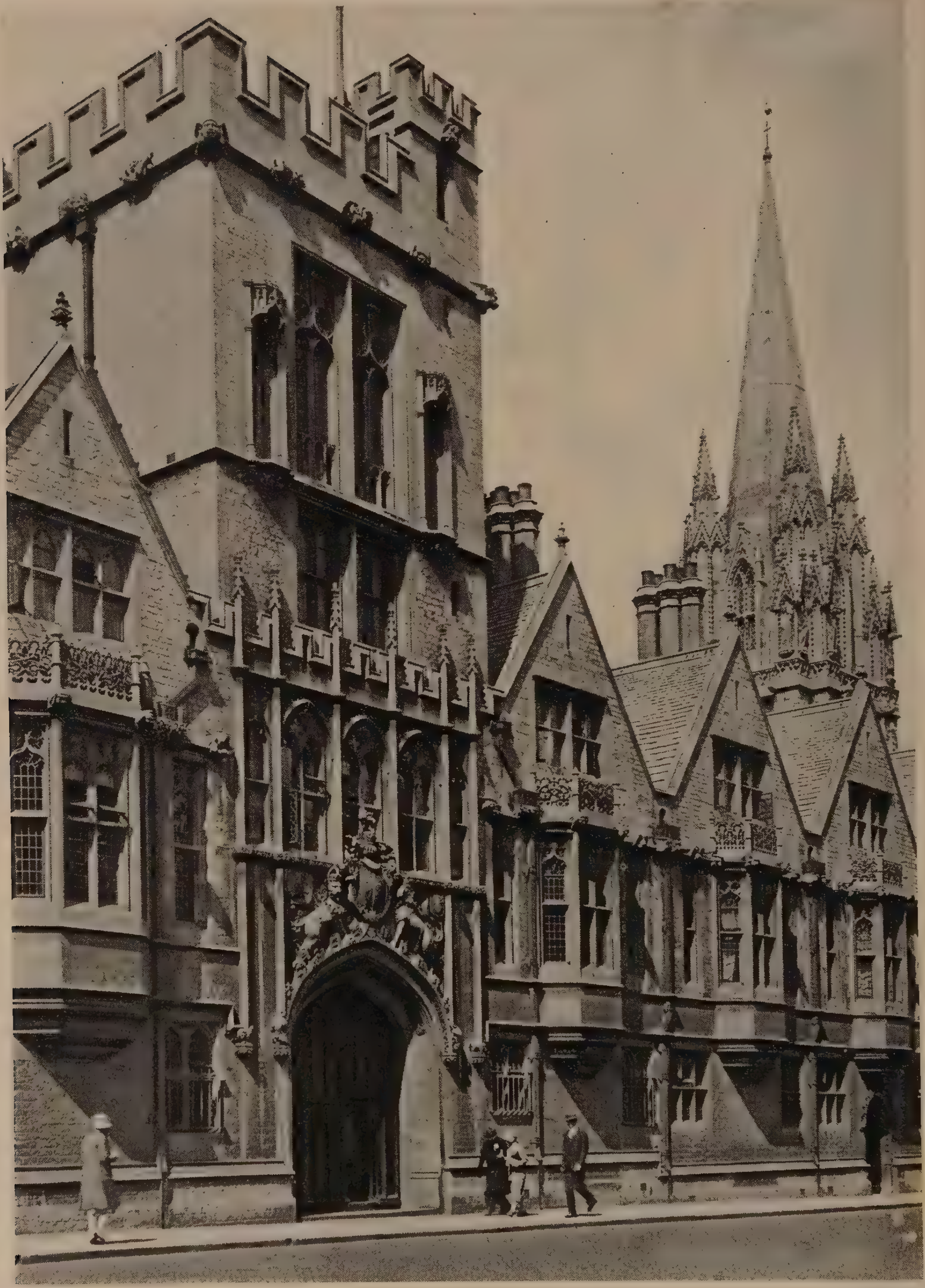
MAGDALEN COLLEGE HAS BEEN A FAVORITE OF ROYALTY

Many royal names have been associated with the history of Magdalen since the days when Edward the Fourth visited there. The present Prince of Wales spent two years in residence as an undergraduate and won for himself a place of deep affection in the hearts of his fellow students. Founder's Tower (above) contains a fine banqueting hall and suite of state bedrooms.



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THE HIGH STREET FRONTAGE AND GATEWAY OF BRASENOSE COLLEGE

Although of recent construction, such exquisite taste has been used in the design and execution of the new college buildings that they are more than worthy successors to the original foundation, begun in the first summer when "Bluff King Hal" occupied the throne of England. To the right is the spire of the Church of St. Mary the Virgin (see, also, pages 564 and 585).

one minute! May I direct your attention to the statute forbidding undergraduates to loiter on the streets. "Good day, sir," the senior proctor replied, tipping his mortar board.

My word was accepted without question, immediately, which I learned was the custom of the court. If I had been caught in the place, or in a public house, or in any other resort forbidden by statute, the penalty might have been a monetary fine or "rustication" (a temporary dismissal from the university), or I might have been permanently "sent down," depending upon the seriousness of the offense and upon my record.

OXONIANS HAVE THEIR OWN "UPS AND DOWNS"

The expression "sent down" is typically Oxonian. One never "matriculates" at Oxford; one "comes up." One does not graduate or leave for a vacation—at least, not in common parlance. One "goes down" or, in the event of a misdemeanor, one is "sent down."

The American word "student" is never used, I was advised, to designate undergraduates in general. The dons, or teachers, at Christ Church are sometimes known as "students," but the members of the undergraduate body of Christ Church, or of any other college, never are. There are the "Delegacy of Non-Collegiate Students" and the "Society of Oxford Home Students," but their members are always referred to as "undergraduates."

Undergraduates are divided into two kinds, scholars and commoners. Scholars at Oxford are in every respect more important than commoners. The former hold scholarships which they have won at secondary schools or in public examination. But the difference is not merely one of finance. Scholars must read for an Honours degree (commoners may if they wish), and every act of the college to which they belong is done in the name of its "Head, Fellows, and Scholars."

In the medieval university the commoner had no place at all. Even to-day only the scholar, or those above him in college, may bear of right the arms of the college on his blazer, or tobacco jar, or stationery, although no rule restricts the commoner, who is usually the most flagrant displayer of them. The gowns of the two classes are different, that of the scholar being long and flowing, while the commoner's is short, like a jacket, and has no sleeves.

When I had learned the distinction between scholars and commoners I was told that scholars are called "demies" at Magdalen, because they originally had half a Fellow's allowance, and "postmasters" at Merton. "Fellows" correspond to instructors in American universities. They are usually selected from the most brilliant graduates. Together with the tutors, who personally supervise each undergraduate's work weekly, the fellows of a college are popularly known as "dons." I discovered that the term "professor" must be guardedly employed if I was to be properly understood. An Oxford professor is a don of some college and usually lectures in the college of which he is a member and a don. There are also "Professors of the University," most exalted of dons, who are also dons of some college. A lecturer or reader, a sort of assistant professor, may or may not be a don. At any rate, he is never referred to as a professor.

When I thought I was in a fair way to grasp a coherent picture of the whole, I was finally informed that All Souls has no scholars; that Keble College has no fellows; that Christ Church, as a cathedral chapter, has a dean and canons, in addition to students (fellows) and scholars, and that one of the colleges of Oxford University is called "University College" for no particular reason—well, I was inclined to throw up my hands and despair of ever getting untangled. I soon realized, however, that there is precious little value in having the terms all "straight," anyway. Classical, but not classified, one must accept Oxford or not at all.

THE RHODES SCHOLARS AT OXFORD

Oxford is, perhaps, the best known of all foreign universities in America, owing to the Rhodes Scholarships, granted since 1904 under the will of the late Cecil J. Rhodes, South African magnate. Each year 32 American college students, usually graduates, are selected on the bases of their records in American colleges and a personal interview, and are awarded a

Photograph by Clifton Adams

POSTING A LETTER IN ONE OF OXFORD'S RED PILLAR BOXES

A small notice just above the letter-drop gives the time of the next collection, "5:15 p. m." It is changed by the postman after each round.

three years' scholarship at an Oxford college. An equal number are selected from the British commonwealths and the colonies of the Empire. In all, about 200 Rhodes Scholars are in residence at Oxford each year.

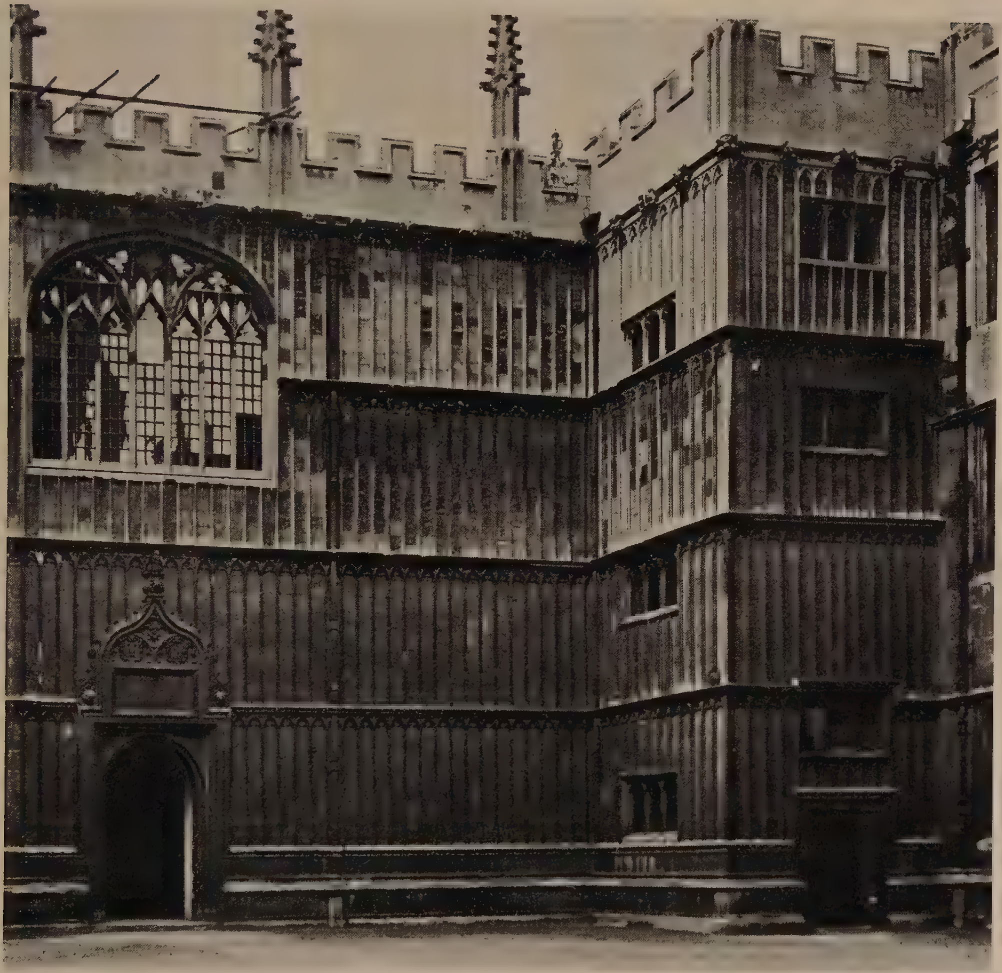
Rhodes, who believed that eventually all the English-speaking peoples of the world would make common cause, hoped through these scholarships to produce leaders for his dream.

I have heard unsympathetic observers at Oxford refer to the American Rhodes Scholars at the university as "the last of the aristocrats," implying that they too often band together and keep themselves aloof from their fellow undergraduates. A difference in age and different heritage of interests, hobbies, and traditions do make fusion, even orientation, difficult.

Most of the Rhodes Scholars with whom I became acquainted at Oxford were of a fine type — friendly, helpful, a bit reserved, as perhaps might become a national of another country, and studiously inclined. Some of the American Rhodes Scholars have been elected to Oxford's most exclusive social and literary clubs and societies, and most of them have enviable scholastic and athletic standings during their residence at the university. The Rhodes idea may be said to be fulfilled to the extent that mutual understanding has been fostered by the contact and conflict of youthful ideas of representative members of the English-speaking nations.

A year ago the Rhodes Trustees issued invitations to former Rhodes Scholars the world over to attend a "reunion" at Oxford from July 4 to July 11, 1929. The event was in connection with the opening of the beautiful new Rhodes House, the most recent addition to the galaxy of Oxford's architectural treasures.

Twenty-five years have elapsed since the first Rhodes Scholars arrived at Oxford. On the evening of July 5 a considerable number of that first group attended the Trustees' dinner in the Hall of Rhodes House, on South Parks Road. Nearly all the two hundred and twenty guests were old Rhodes Scholars. The



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THE BODLEIAN AT OXFORD IS ONE OF THE WORLD'S GREATEST LIBRARIES

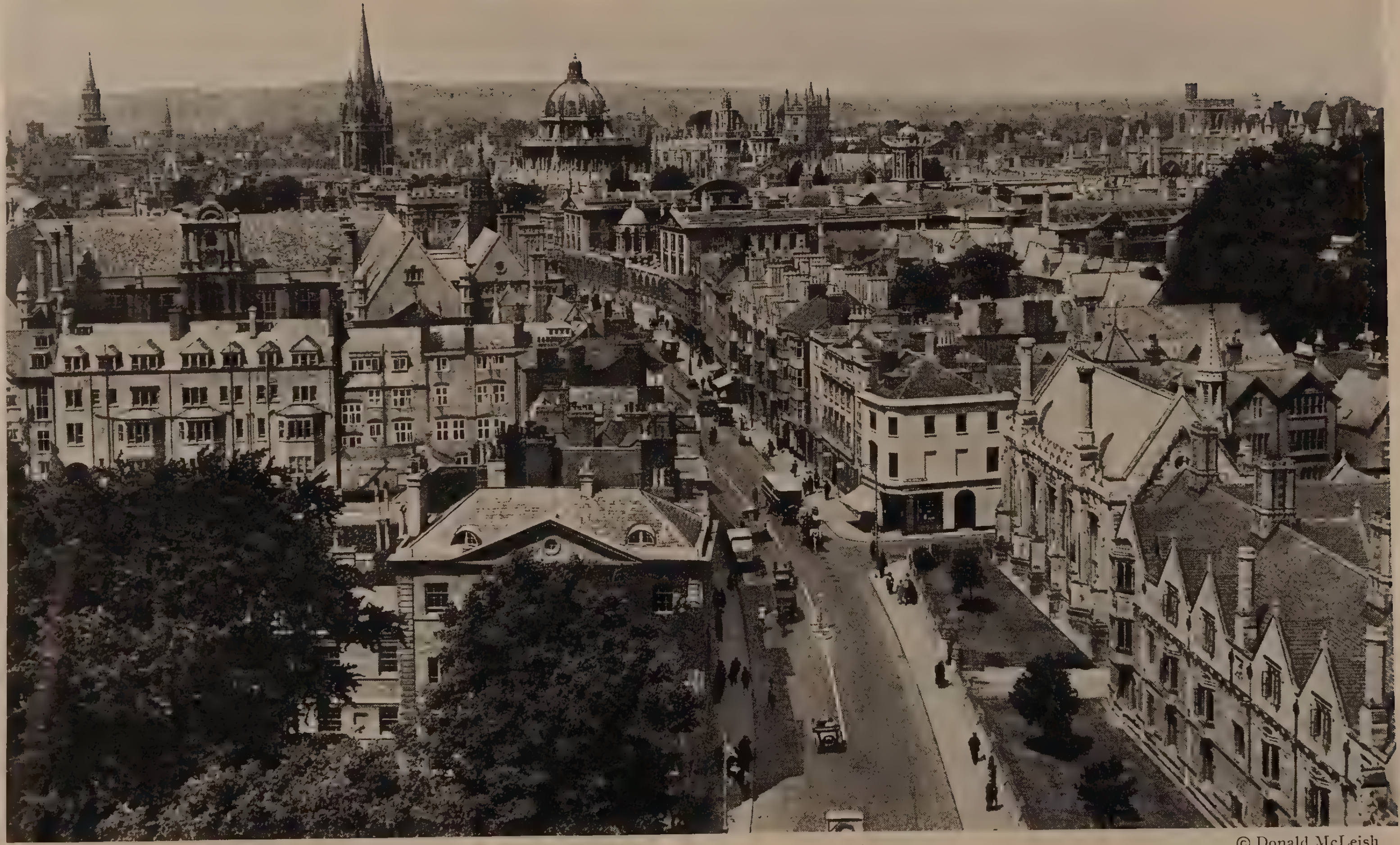
Founded more than three centuries ago by Sir Thomas Bodley, the superb collection now contains about 1,250,000 bound volumes and some 40,000 volumes of manuscripts, many of them of inestimable value. Among its special treasures are a copy of Gutenberg's Bible, a Shakespeare collection of 5,000 volumes, and manuscripts of Wycliffe's Bible and of Shelley's "Prometheus Unbound" (see, also, text, page 587).

largest number were from the United States, but there were some who had come, for this event, all the way from such distant lands as South Africa and Australia. Mr. Stanley Baldwin presided and the Prince of Wales, as principal speaker, proposed the health of the Rhodes Scholars.

In addition to Rhodes Scholars, many other Americans, like myself, are attracted to Oxford by the unrivaled resources for research afforded by the Bodleian Library, and also because the atmosphere of the city is conducive to literary and academic work. Oxford is a mecca for American college professors and instructors on sabbatical leave.

TWENTY-FOUR WEEKS OF STUDY IS THE OXFORD YEAR

The method of study at Oxford is quite distinct from that in American universities. The actual time in college is much less, too, for the Oxonian usually comes up early in October for a term (the Michaelmas) of eight weeks, followed by a vacation of six weeks at Christmas; then another term (the Hilary) of eight weeks,



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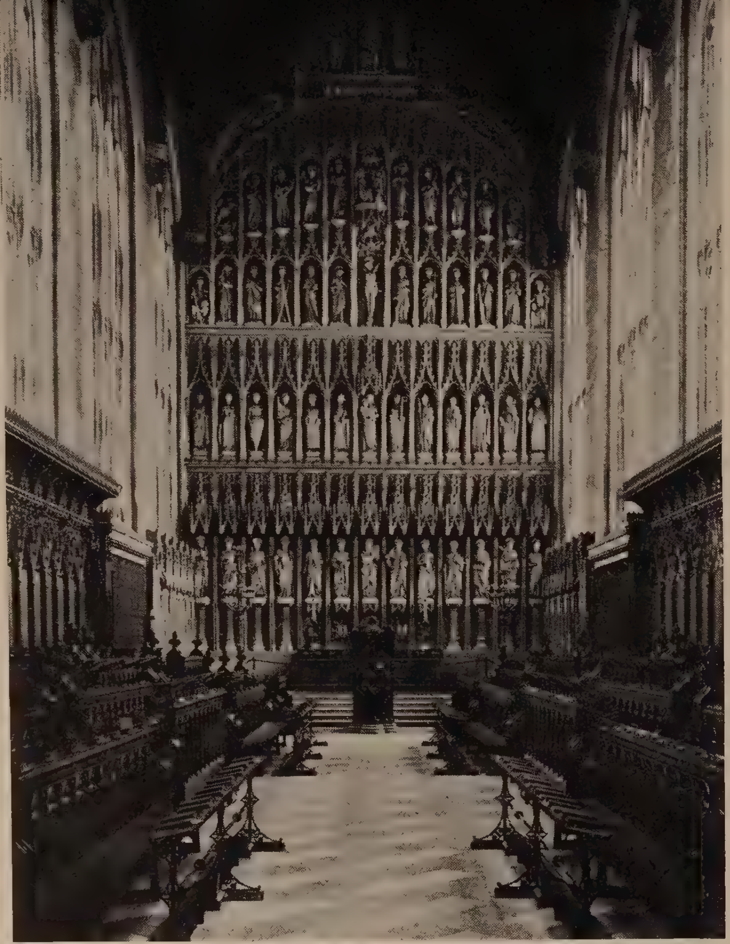
"THE HIGH," AS IT IS FAMILIARLY KNOWN TO OXONIANS, IS ONE OF THE WORLD'S MOST INTERESTING THOROUGHFARES

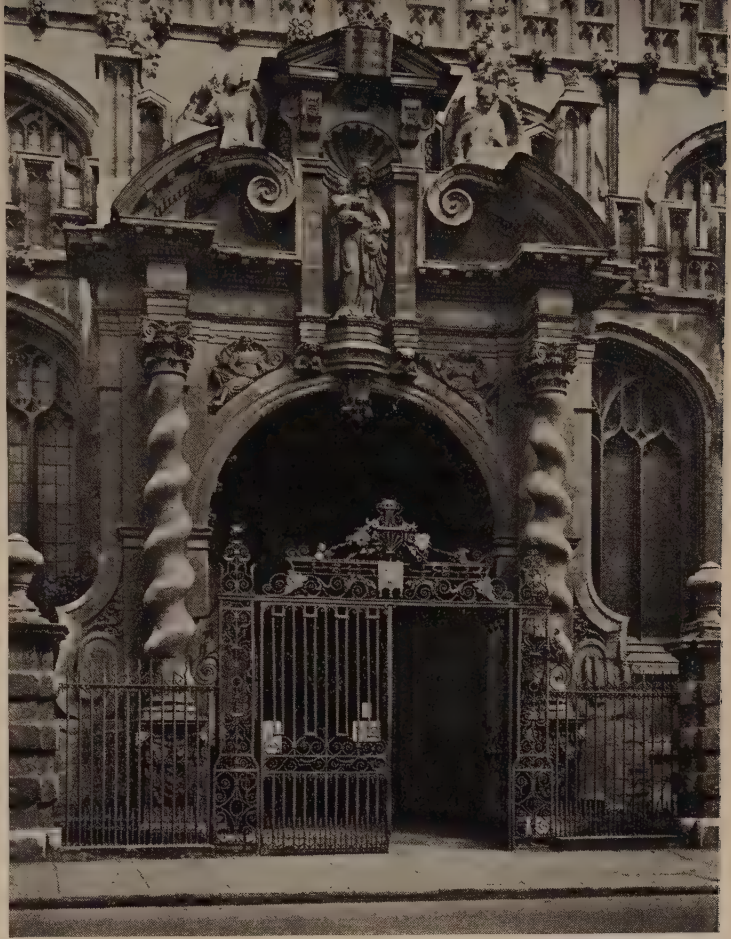
Running from the center of town at Carfax, out to the Magdalen Bridge, High Street passes through the very heart of the Oxford University district. Several of the colleges face on it, as well as the exquisite Church of St. Mary the Virgin (see pages 564, 580, and 585), whose spire rises near the dome of Radcliffe Camera (see page 589).



Photograph by Ewing Galloway

FIGURES OF ANGELS, APOSTLES, MARTYRS, AND PROPHETS ADORN THE SCREEN IN NEW COLLEGE CHAPEL

Paradoxically, New College derives its name from the fact that it is one of the oldest institutions at Oxford, its foundation dating from 1379.



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THE CHURCH OF ST. MARY THE VIRGIN HAS MANY HISTORIC ASSOCIATIONS

Peter Martyr, Cranmer, John Wesley, Keble, Pusey, and Newman all made history, much of it tragic, within the ancient walls of St. Mary's.

Photograph by Topical Press Agency

PREP SCHOOL BOYS TAKE PART IN A "RAG" AT REGATTA TIME

Youthful students at a preparatory institution near the university are engaged in a practice upon which they will frown disdainfully after they have become Oxford undergraduates. The approved "rag" of pure Oxford vintage is an affair of real wit and not a mere clowning exhibition such as this.

with six weeks' vacation at Easter; and a final (Trinity) term of eight weeks, followed by a three months' summer vacation.

The long vacations are not entirely "rest" periods. A great deal of supplementary reading is assigned for these intervals. Three years is the customary length of time required to complete the course for the Bachelor of Arts degree.

In contrast to American schools, Oxford's lectures have relatively little importance. No attendance records are kept and an undergraduate might possibly go through his entire course without attending a single one. The real check is the tutor, to whom the undergraduate is immediately assigned upon his arrival and to whom he must report at least once a week for assignments, recitations, and informal discussions. The tutorial system allows for much greater development of a student's natural bent and individuality, but it is practical only where the number of students is not large. The average number of students at an Oxford college is about 200. In the regular course of events, examinations do not come until near the end of the second year of residence, and everything depends upon the showing made in them.

The teaching staff at Oxford consists of university professors, readers, lecturers, and demonstrators, numbering more than 100, and about 300 college fellows, tutors, and lecturers.

As is the case in American universities, there are faculties leading to specific degrees, the principal ones at Oxford being Theology, Law, Medicine, Literae Humaniores, Modern History, Medieval and Modern Languages, Oriental Languages, and Natural Science. Both the colleges and the university give lectures, and each coöperates to promote academic harmony and efficiency. Members of any college are at liberty to attend any lectures, university or collegiate, which their tutors recommend and without the payment of special fees.

THE CHARM OF THE TOWN ITSELF

But the academic, vital and fundamental as it is, is really the reverse side of the medal. Oxford is more than classrooms, and degrees, and rules and regulations, and their exceptions. F. D. How no doubt exaggerates when he says: "For beauty and for romance the first place among all the cities of the United Kingdom must be given to Oxford." But one must search far to find an equal of the mellow beauty of its winding streets and its classic buildings, or of the pastoral charm of the meadows and walks along the Cherwell and the Isis, or of the romantic associations of the place, from Alfred the Great's day to the World War.

Walking down High Street, affectionately known in Oxford as "the High," I believe I caught some of this feeling of beauty and romance in the long curved fronts of the colleges and churches and other stately buildings which border it; for High Street is Oxford and, incidentally, one of the most beautiful streets in the world.

Beginning at Carfax, the center of town, it curves gently for half a mile or more to the Magdalen Bridge, unfolding vistas of spires, and stout stone walls, and moss-covered cornices, and towers, and courtyards, and a thousand and one things, each more lovely than the last, until one begins to regret that such delight cannot last and must dwindle at the end to some mediocrity.

But at the end of the High is reserved the most charming view of all. Rising gracefully from the buildings of Magdalen College is an exquisite Gothic bell tower, from which each year a 17th century eucharistic hymn is sung at sunrise on the first of May.

Directly opposite are the verdant, spacious grounds of the Botanic Garden, the oldest in England, and, to close the picture, beyond is the River Cherwell, with its screen of bordering elms and willows and the stately arched bridge which carries the High toward London town.

Some prefer to reverse the picture I have just drawn, and it is charming the other way. But Carfax, with its noisy bustle and confusion, brings one just a bit too suddenly to earth. It is better to linger on Magdalen Bridge, where one may drink deep of scenes that belong to another world—truly a world of romance and beauty.

There is yet another spot in Oxford where one may feel this age-old unreality. Not far from the High is a round-domed building (the dome is the entire building) known as the Radcliffe Camera, the reading room of the Bodleian Library. A small fee will admit one to a stairway which winds up and up to a circular outdoor gallery far above the street (p. 589).

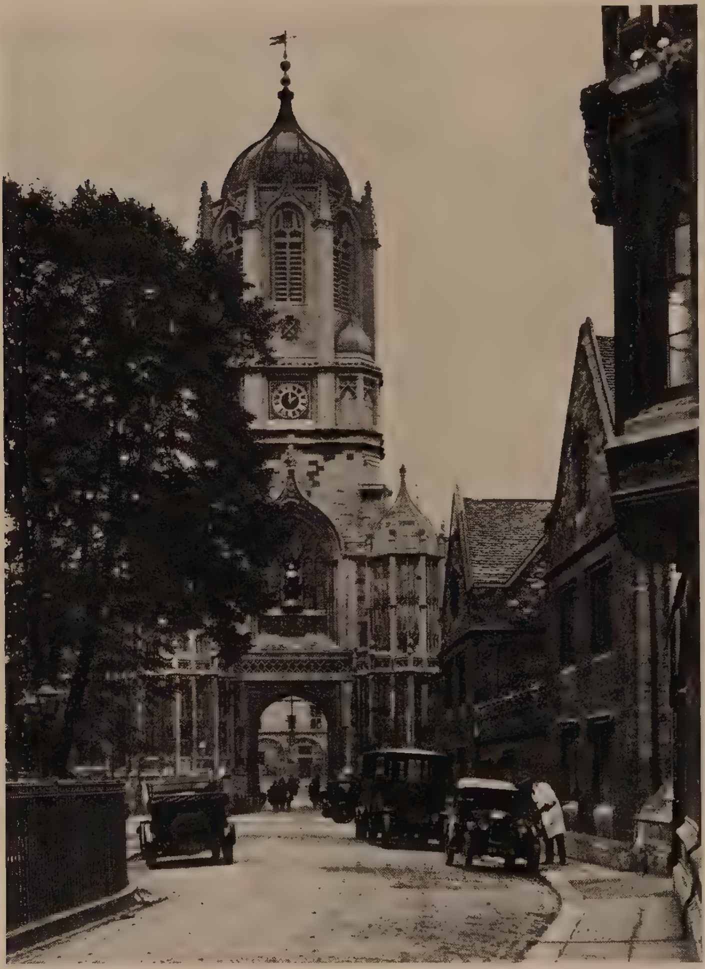
Below and all around is spread a veritable forest of stone turrets, towers, arches, battlements, spires, and delicate tracery. Massive pieces of masonry they undoubtedly are, but from this height they seem light and airy, exquisitely delicate and graceful. Refinement of detail is lost in the splendid upward sweep of whole buildings, although one is conscious of embellishments which carry the eye and delight the spirit (see, also, page 567).

Haphazard as was Oxford's growth, there is a symmetry in her architecture which many another city of less spontaneous origin might envy.

Beyond the colleges, to the east, is the green-forested slope of Headington Hill; to the south, perhaps a bit dim in the mist which rises from the meadows along the Isis, is Boars Hill, nearest of the gently rolling Berkshire Downs; to the west are the railroads and the commercial districts; and to the north are the principal college gardens and the University Parks.

"THE GRANDAD OF ALL ENGLISH LIBRARIES"

A short cut from the Radcliffe Camera through the old Divinity School leads to



Photograph by Clifton Adams

TOM TOWER HOUSES GREAT TOM, THE LARGEST OF OXFORD'S MANY BELLS

Since 1684 the 7-ton giant has sounded curfew for town and gown, except during the World War. At 9:05 every night its booming voice sounds 101 times—the number of original students at the college plus one—giving the signal throughout the university for the closing of college gates. Those who fail to heed the summons must pay "gate money" until midnight, after which hour the college gates open for no one. Tom Tower belongs to Christ Church, the largest college in Oxford.

the Bodleian Library, the grandad of all the English libraries in the world. Over the entrance doorway is a Latin inscription, and the worn wooden stairs that lead to the Library itself creak as if their last days had come. But these stairs have creaked to the footsteps of countless thousands for centuries (see page 583).

The Bodleian is one of the six libraries that enjoy a right to a copy of every book published in the United Kingdom. In size its collection is exceeded in western Europe only by those of the British Museum and of the Bibliothèque Nationale. As a source of material concerning the life and letters of England and of a good deal of the rest of the world, it is unsurpassed.

The Bodleian still clings to the ancient system of listing its volumes in huge parchment index books, pasting in a slip of paper when new books arrive. I missed our handy card-index method, although many of the manuscripts are now listed by cards.

WHERE THE OXFORD DICTIONARY WAS COMPLETED AFTER 44 YEARS

Close to the Bodleian Library is the scene of the greatest philological enterprise in recent years. Within the smoke-incrusted walls and time-chipped exterior of the Ashmolean Museum, which should not be confused with the New Ashmolean Museum in another part of town, the final pages of the great Oxford English Dictionary, the publication of which was begun in 1884, were last year completed for the printers (see page 574).

Forty-four years is a small span in the life of a language, but in these days of high-speed production it seems an incredible amount of time to be devoted to the publication of a single undertaking, and particularly to one so costly as a master dictionary. With the completion of this titanic work, the greatest single effort in its field since the invention of printing, academic Oxford may have an additional right to feel unconcerned about upstart modern enterprises which threaten to overwhelm her.

The preparation of so prosaic a thing as a dictionary in even so somber and uninviting a structure as the Ashmolean Museum was not without its humorous incidents. One of the editors told me that when work was shifted to this building, in 1901, it was for some time liable to interruption by strangers inquiring for the New Ashmolean Museum. An assistant who was specially exposed to such inquiries finally took a sheet of cardboard, printed on it, in large capitals, "This is NOT the Ashmolean Museum," and hung it on the inner door.

As this expedient did not prevent inquiry being made for other university buildings, he successively added, in alternating lines of black and red ink, "Nor the Sheldonian Theater," "Nor the Bodleian Library," "Nor the Clarendon Building," and, finally, "Nor the Martyrs' Monument—as yet!"

Photograph by Charles E. Riddiford

A PUPIL OF THE IMMORTAL WREN DESIGNED RADCLIFFE CAMERA

James Gibbs built this unique Renaissance structure for Radcliffe, physician to William III. It is now used as part of the Bodleian Library, containing a general reading room and housing most of the newer books of that famous collection. The Divinity School (at the right) was built in 1445-80, on a scale of great magnificence, but during the Commonwealth was used as a storehouse for corn.

The district surrounding Oxford is mostly rolling farmland, broken here and there with a bit of woodland or marsh. "The whole country," one English writer says, "is of that peculiarly English character which so arrests the attention of foreigners—green, tranquil, mellow; old yellow hamlets bathed in afternoon sunshine; the peaceful corn fields, where the pathway winds along the hedge, under the shadow of great oaks and elms; the meadows, whence the last load of hay is just being carted off and the vivid green below shows like a carpet of emeralds; the church, six hundred years old; the Manor House, of 'gray renown'—all such things as speak of immemorial tranquillity and unbroken order and that humble happiness which we sometimes think a mere poetic fiction."

The "corn field" to which the writer re-

Photograph by Cillman

OXFORD UNDERGRADUATES HIKING TO THE SCENE OF A BEAGLE HUNT

"Hunts," or "packs," such as the Christ Church Beagles, are usually organized by a few wealthy undergraduates, but anyone may join the regular members on the day's hunts—anyone, that is to say, who will not refer to the hounds as "dogs," or make the tactical error of bringing a gun. The object of the hunt is to tire out the quarry by showing greater endurance, and, even though one knows which way the hare is circling, it is not considered good sportsmanship to cut across the diameter of the circle to head it off.

fers would be called a "wheat field" by Americans.

EACH COLLEGE HAS ITS DISTINCTIVE FEATURE

Each college in Oxford has so many distinct and interesting associations and traditions that even a listing of them would require more space than such an article as this permits. St. John's and its matchless garden front; Worcester and its lake and "cottages"; Exeter's Chapel and tapestries; Wadham's charming Fellows' Garden; New College's cloisters and altar screen and stained glass; the beautiful reredos of the All Souls' Chapel; Magdalen and "Addison's Walk"; the Library and "Mob Quad" at Merton. The list is almost endless.

In Tom Quad, Christ Church has the distinction of possessing the largest college quadrangle. This magnificent inclosure measures 264 by 261 feet, being almost large enough for a football field. In the center is a fountain and around the walls can be traced the commencement of cloisters with which it was intended to complete the quadrangle. To my mind, the Quad is at least as attractive without the cloisters.

In Christ Church I discovered another of those charming inconsistencies typical of Oxford. As an integral part of the college, yet of separate foundation, is Oxford Cathedral, the smallest in England. It serves both as a college chapel and as the cathedral church of the district. During the World War, Christ Church was headquarters for the Royal Flying Corps ground school.

CLASSES MUST NOT INTERFERE WITH SPORTS FROM 1 TO 5 P. M.

Christ Church naturally led my footsteps to the pleasant meadows which stretch from the college walls to the barges

© Donald McLeish

UNIVERSITY COLLEGE CLAIMS AN ANCIENT LINEAGE

Balliol and Merton both dispute University's claim to the most venerable Oxford collegiate ancestry. Although it is quite generally established that it received its first endowment from the Bishop of Durham in 1249, many of its adherents claim Alfred the Great as its founder. Some extravagant enthusiasts trace its beginnings back to Noah's time, pointing in their ancient college chapel to a quaint stained glass window which depicts the story of the master of the ark and, in the same scene, a vessel flying a flag bearing their college arms.

along the Isis, as Oxford chooses to call the part of the Thames River which flows by its doors. Here is the battleground for the greatest athletic rivalry the university knows.

As might be expected in the youth of a nation which has always manifested intense affection for the water, the chief sport at both of its greatest universities is rowing. There is football—a "rugger" football, which is quite distinct from our American game — soccer, sports (track events), hockey, tennis, croquet, boxing, lacrosse, and the inevitable cricket. Baseball, basketball, and gymnasium sports are unknown, except when groups of American or colonial students get together for exhibition contests.

The mild English winters enable athletes to practice outdoors almost every day in the year, and university lectures are arranged so that no classes are held between 1 and 5 o'clock. The entire afternoon is thus left free for outdoor recreation — almost a necessity in the damp, chilly climate.

© Central Aërophoto Co.

RIVALRY REACHES ITS HEIGHT IN THE ANNUAL OXFORD-CAMBRIDGE BOAT RACE

The two varsity eights have just passed under the Hammersmith Bridge, while a fleet of launches follows at a discreet distance. The course is on the Thames River from Putney to Mortlake, a distance of four and a quarter miles.

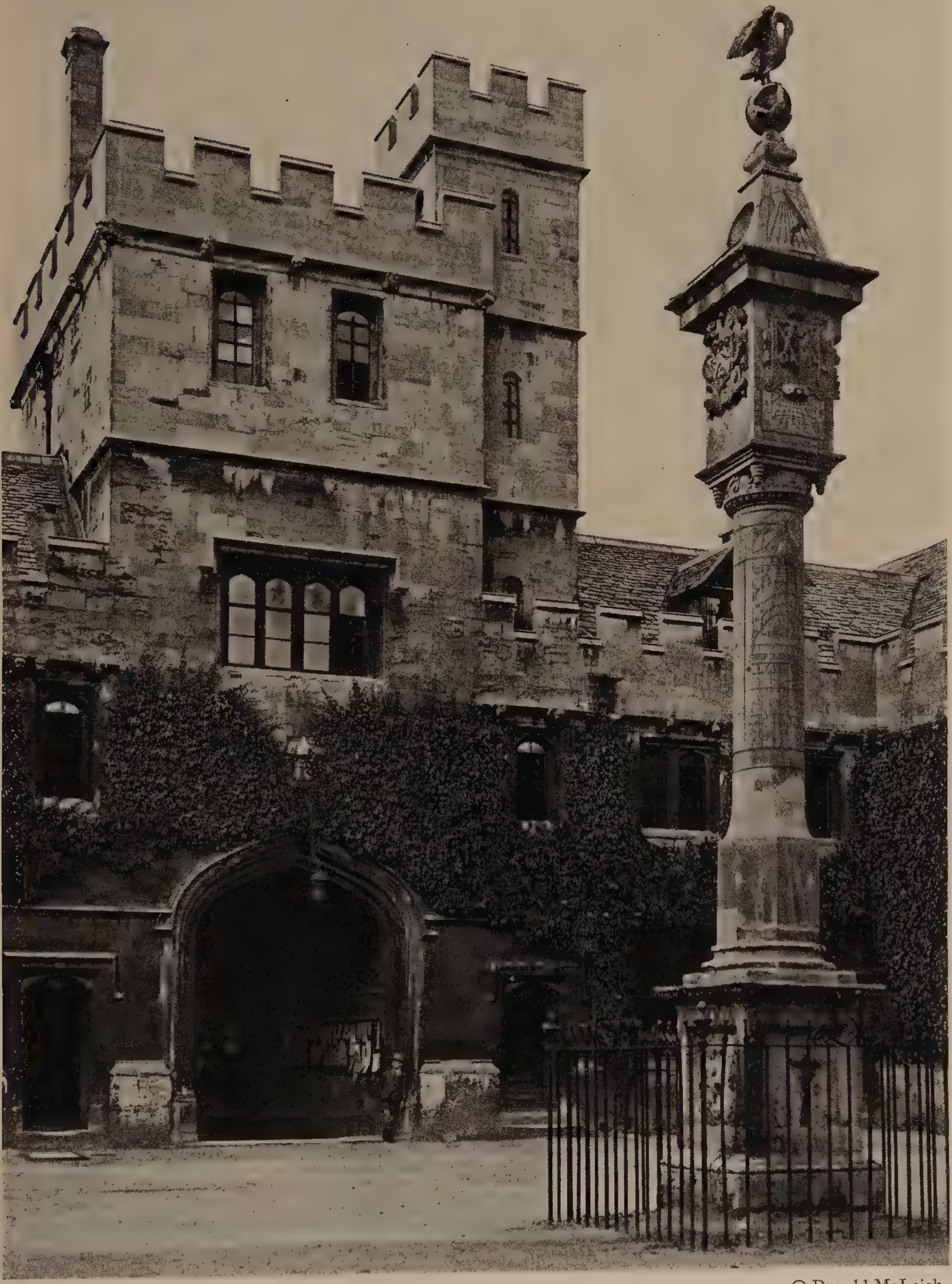
Rowing arouses all the enthusiasm and rivalry among English students that football does among our own. There is, however, rowing *and* rowing. While it is true that the annual Oxford-Cambridge crew race sometimes attracts as many as 150,000 spectators, it is a national rather than a varsity event; at least, it is as far as student interest goes. Many undergraduates of each university will not bother to go down to London in the early spring for the match, but no undergraduate not on the sick-list would miss the river events of Eights Week, in June, when the college crews compete.

In Eights Week, however, all the competition is confined to the crews of colleges within the universities, and each university holds the events on its own stretch of river. Varsity crews are then disbanded, and acclaim goes equally to the men who have won seats in the first or second eights of their colleges, whether they have been former varsity oarsmen or not.

In the annual race at London the crews compete much as do those of America. The two shells line up abreast, and the first to cross the finish line at Mortlake, four and a quarter miles from the starting point, is declared winner. It is a grilling endurance test. My chief recollection of it, however, was the ease with which I secured a place of vantage near the finish line. The English apparently do not concern themselves so much about the winner of the race as they do about the manner in which it is rowed.

BOAT CREWS RACE SINGLE-FILE

The first Eights Week crew race I witnessed proved very confusing. English university rivers—the Isis at Oxford, the Cam at Cambridge—are very narrow and have given rise to a distinctive form of racing unknown elsewhere. Unlike our Poughkeepsie and our Childs Cup races, or even the Oxford-Cambridge Varsity race, in which the competitors race abreast and the head boat at the finish line is winner, the English Eights Week races are rowed in two or three divisions, the first



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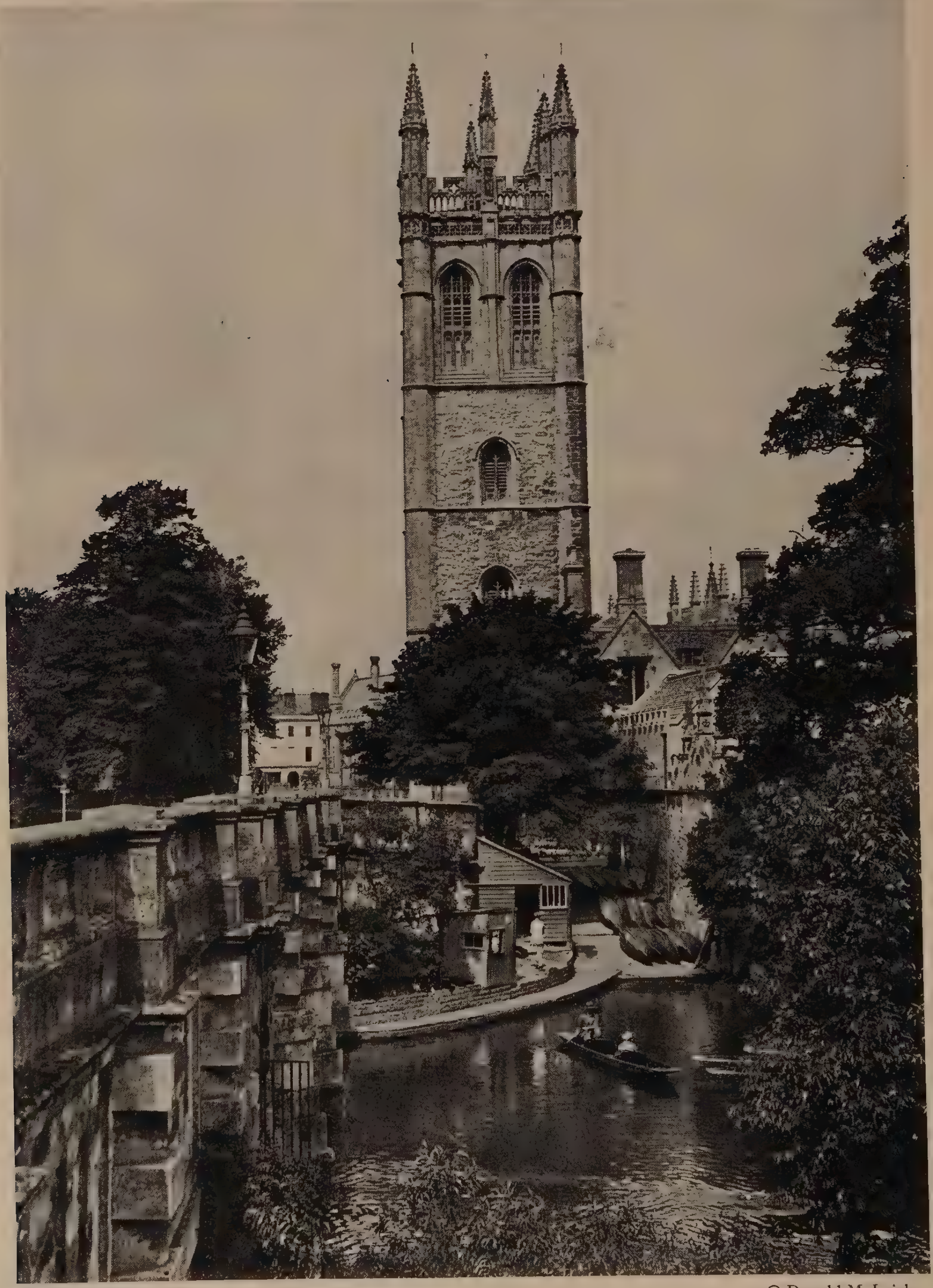
THE FRONT QUADRANGLE OF CORPUS CHRISTI IS FOUR CENTURIES OLD

Richard Foxe, Bishop of Winchester, founded Corpus Christi College in 1516-17, "to the praise and honor of God Almighty, the most holy body of Christ." In the foreground is the famous cylindrical sundial and perpetual calendar. Among the prominent members of this college was the philanthropist, General Oglethorpe, who established the Colony of Georgia.



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MAGDALEN'S BELL TOWER REVEALS MANY CHARMING ASPECTS

Each May Day, at 5 a. m., the college choir sings a Latin hymn from the top of this perfectly proportioned structure, and the bells peal forth a glad salute to approaching summer. The River Cherwell flows peacefully under Magdalen Bridge.

division starting latest in the day, and the boats in each division are strung out in a long single line, 150 feet apart.

The object of each boat in the race, with the exception of the head one, is to overtake and to "bump"—that is, to touch—some part of the boat ahead with the bow of its own. The head boat, which secures its exalted position owing to a victory in the preceding year, must keep away from all the boats behind or rélinquish its place.

A "bump" is acknowledged by the coxswain raising his hand, which is done at once, not only for the sake of sportsmanship, but also for safety, for a stroke was once killed by the sharp prow of a pursuing boat. Prows are now covered with a gutta-percha knob, but accidents are still not unknown when signals are tardy. The two boats must then get out of the way of others, or the victor may itself be bumped by the next boat behind. If the boats succeed in getting out of the way without further bumps, the boat which has just scored a bump moves up one place in its division. The bumped boat loses a place.

Sensational advances are not possible. The races are held every afternoon for six days, and the very most any college can hope to advance in a single day is two places, or perhaps, by some miracle, three.

There is no judges' and coaches' boat. Oxford and Cambridge crews are all trained by volunteer former oarsmen, who devote a great deal of their time to this altruistic work.

All the colleges have eights, some of them more than one eight (two or more may be entered by each college); so if at least one crew of a college is not well up in the first division its chances of coming out at the head of the river that year are remote indeed.

"The ideal place for a very good boat for which the headship of the river is unattainable is No. 2 in the second division," one Oxford rowing authority claims. "The second division race being rowed earlier in the afternoon than the first, the boat may bump the leading boat of the second division and thus become the last boat in the first division.

"A boat thus placed is known as the 'sandwich boat.' Then, if it succeeds in making a bump in the first division, it will have made two bumps in one day and will have a chance of performing the extraordinary feat of going up seven places in six days' rowing, which can only be achieved by a boat which passes from a lower division to a higher. Of course, every man in every boat pulls for all he is worth and a bit more, but two bumps on the first day may give an élan to the crew of a value simply incalculable."

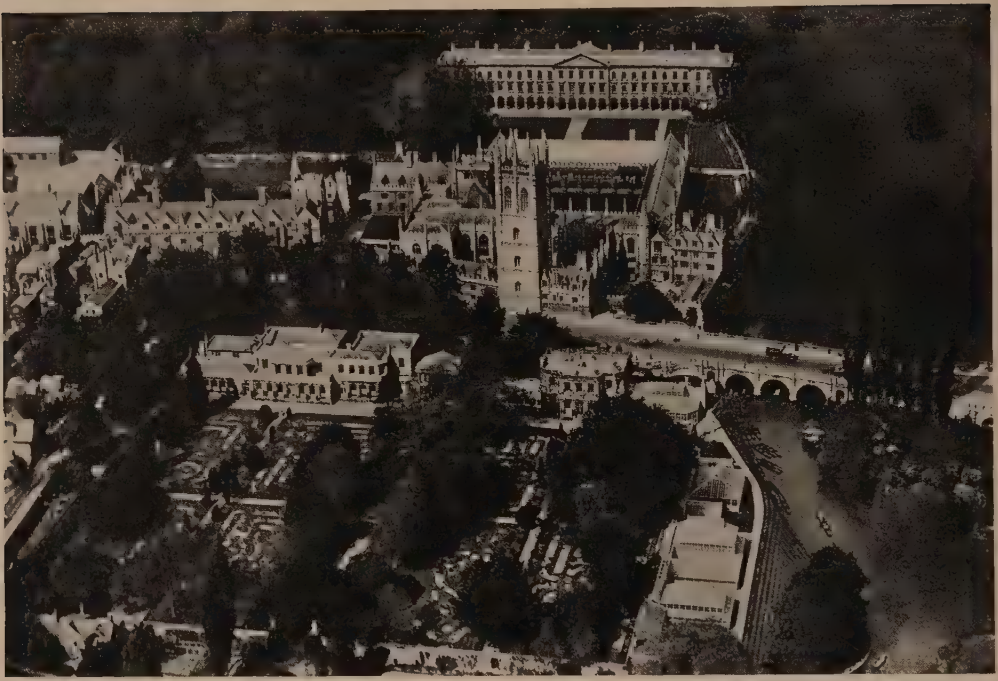
The "Torpids," as the races of a similar character in heavier boats are termed, serve as preliminary contests earlier in the year. The interval between boats is 30 feet greater than it is during Eights Week, when sliding-seat shells are used.

WHERE THE OXONIAN AIRS HIS SCORN OF THINGS OF GENERAL ACCLAIM

While Oxford has borne with somewhat of an air of diffidence its crown of thorns, proclaiming it to be the home of "Lost Causes"—Charles I, the Jacobite Reaction, the Methodists, the English Renaissance, the Classicists, etc., etc.—it is as a blight on accepted ones that young Oxford would rather be noticed, if at all. In the university (nonofficial) clubs, such as the Oxford Union, the Oxonian airs his scorn of things of general acclaim and accessibility.

Anyone in the university may join the Oxford Union—in fact, it is said that only the strong-minded can refrain from doing so, owing to the activity of college representatives of the club among the new men—and on Thursday nights a good part of the undergraduate body, including not a few dons, nonmembers, and guests, strolls down to the big auditorium, "the nursery of the House of Commons" it has been dubbed for a hundred years, to listen to debates on every conceivable subject.

The subject, however, is not important. The presence of most of the undergraduate spectators depends upon a few well-known student speakers with a gift for fluent epigram and witticisms (but not jokes) in the traditional Oxford manner. After these have spoken, most of the spectators file out one of the two doors, marked "Aye" and "No" respectively, and so indifferent is the average undergraduate about the outcome that he often chooses the least crowded door, and may even fail to ascertain the next day or the next week which way the division ran.



Photograph from Aërofilms Limited

MAGDALEN COLLEGE FROM THE AIR, WITH THE BOTANIC GARDEN IN THE FOREGROUND AND RIVER CHERWELL AT THE RIGHT

It has been claimed that many places in England and in other countries offer as good book learning as does Oxford; but the loyal Oxonian will tell you, if you press the matter, that the motto of Oxford University, "Dominus illuminatio mea," implies more than the "light" to be obtained from books and lectures; "for it is not only the walls and spires of Oxford that are 'frozen music,'" he will explain. "There is a frigidity of the heart that keeps its song inviolate. To be cool, casual, contemptuous—in a word, emotionless, with the innate remove of a Brahmin or a Samurai—that is Oxford!"

That, I think, is a bit extreme, but I could not help sensing that the Oxford "manner," if such a thing really exists, is one of nonenthusiasm and defensive nonchalance. The American instinct, for instance, to "start something," lead a reform movement, organize a fraternity system or a daily paper, or even to propose a college yell to "pep up" the place, falls of its own weight in so rarefied an atmosphere, not because such instincts are foreign to the Anglo-Saxon, but because Oxford is the well-nigh insoluble crystallization of centuries of trial and error, in the course of which almost every conceivable idea has been given a chance to prove itself.

Oxford has achieved that serenity of old age which counsels itself with the thought that not every new idea is a good idea; and, furthermore, there are no new ideas!

And yet the spirit of youth flourishes in the rich mold of this antiquity. The visitor sees it in the flushed and ruddy cheeks of the briskly walking scholar, his black gown fluttering behind him as he hurries to his class or tutorial. Back of professor's serious mien I believe I glimpsed a deeper optimism and a faith which have enabled this great seat of learning to come down through the ages undiminished in vitality, complacently unaffected, in the rôle of "the home of lost causes, and forsaken beliefs, and unpopular names, and impossible loyalties! . . . This Queen of Romance! . . . This Mother of Learning! . . ."

GENTLEMEN ADVENTURERS OF THE AIR

Many Regions of Canada's Vast Wilderness, Long Hidden Even from Fur Trappers, Are Now Revealed by Exploring Airmen

By J. A. Wilson

Author of "Canada from the Air," in the National Geographic Magazine

Illustrated with Photographs from the Royal Canadian Air Force

IN A Golden Age of centuries agone it was the Sea Hawk, daring, cutlass-rattling skipper of galleon or caravel, who careened over stormy, unknown seas to find strange lands of treasure and a life unlike any that Europe knew.

To-day, wiping out distance with wings, bold *skippers of the sky* spy out the last raw, empty regions of the world, as airmen are doing now in northern Canada. Here, breaking the silence of centuries, their planes drone and growl from Labrador to the Yukon, exploring a wilderness kingdom almost as large as the whole United States.

Just as daring their air cruises are as any sea voyage of old, when a golden palace of the Incas or fabled Seven Cities of Cíbola was the goal. Just as interesting, too, and full of exciting surprises, and far more profitable; for, in place of men in coats of mail, armed with crossbow or primitive arquebus, they carry engineers and geologists armed with scientific instruments, miners with picks, and cooks with pots and pans—and plenty of food, tents, tools, and camp supplies for the economic conquest of this new Eldorado.

Since the World War, airplanes have perhaps done more to open up and reveal the undeveloped wealth of northern Canada than men on foot, in canoes, or on dog sleds had done in the previous three centuries. By yet another comparison, the airplane now does for this wilderness of the far north what pony-express riders and ox-team freighters did for the golden West of the United States before railways crossed the Plains. In one year a certain Canadian air line carried 122,000 pounds of mail, 1,200,000 pounds of freight, and about 10,000 passengers!

Prosaic? Merely a truck driver's life after all, hauling freight and passengers over clouds instead of up and down hills? Not in that vast, untouched expanse, where man now makes his last great struggle on this continent to wrest fortune from a virgin mineral region! Hurtling over herds of staring caribou; startling the placid moose; now and then glimpsing even the savage grizzly roaming along the ridges, Canadian airmen may look down on hills and valleys where no man's foot, not even an Indian's, has ever been planted,—flying above a Garden of Eden, as it were, although a rather cold garden at times, before man was made and set in it.

LITTLE KNOWN OF GREAT NORTHERN EMPIRE

For northern Canada, despite its proximity to civilization, remained almost a sealed book till airmen explored it. The Cabots came, of course, 400 years ago; then Frobisher, exploring its coasts; Davis, and Henry Hudson. Then came that great group of gentlemen traders—magnificent, enduring monument to the continuity of British commerce—the Hudson's Bay Company. Long before airplanes, Canada's general outline was known and her main waterways were explored and used. They were the familiar routes of fur traders and trappers, whose industry is still of great importance. But the vast interior itself, that still almost trackless region which stretches from the northernmost settlements poleward, had, till a very few years ago, been seen by no white men at all.

But now industrial Canada faces north. She seeks to roll back her wilderness frontier and double her productive area.

PROSPECTORS BRAVE THE NORTH AT ITS WORST

Winter bites deep in the Richmond Gulf country in January, but these hardy miners carry on despite snow and cold.

PIONEER DAYS STILL LIVE IN CANADA'S LAST FRONTIER

These Chippewaian Indian trappers of the Reindeer Lake district in Manitoba have brought their winter's harvest of pelts to sell to the Hudson's Bay Company at Brochet. The trade goes on here much as it did in the time of Frontenac, but now airplanes carry the furs to market, saving months in time of transportation (see text, page 633).

Up to Hudson Bay a railroad is driving, to shorten the water haul of wheat to Europe.

Already, as the world of mining well knows, tremendous development is under way in that great pre-Cambrian shield, 95 per cent of which lies in Canada. Though as yet barely scratched, it has brought forth the famous Cobalt silver camp; the great copper-nickel field at Sudbury; gold mines of Kirkland Lake and Timmins district; the Rouyn field in northwest Quebec; Chibougamau, northeast of Lake St. John; the Flin-Flon and Sherritt-Gordon mines of northern Manitoba, with their hundred miles of railway into northern wastes, as well as kindred activities in north Saskatchewan and down the Mackenzie basin (see map, page 600).

NATIVES CHERISH DOGS AS THEIR BEST FRIENDS

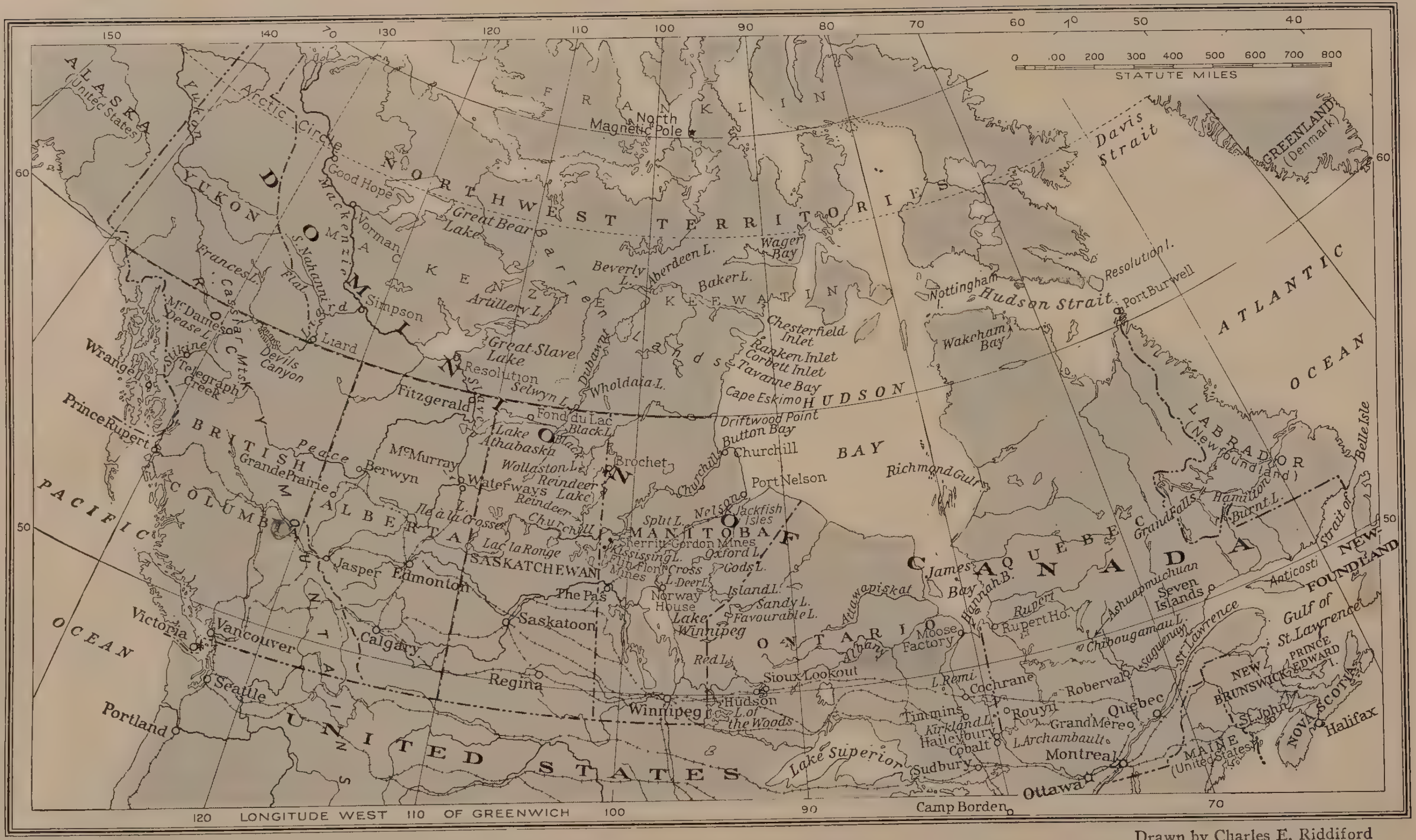
These woolly puppies are more than pets to the girl of Wakeham Bay, for when they have attained full growth they will help draw the sleds that are the only means of transportation for eight or nine months of each year. Without them the tribes of the north would perhaps soon perish.

Copper, gold, silver, nickel, zinc—these are the minerals which lure the Canadian prospector ever and ever farther north. From Montreal, from Toronto or Winnipeg, miners by the hundreds start by rail. At railway's end, or in such places as The Pas, in Manitoba, or Hudson and Sioux Lookout, in Ontario, airplanes wait to take men farther north.

From "the end of steel," before airplanes came, it took weary weeks to reach many of these regions, known now to be rich in minerals, in forests, and in potential water power. Now, barring mixups with blizzards, one may fly from New York, Montreal, Minneapolis, or Seattle to these new fields of wealth in two days. Using the frozen lakes as landing fields and "picking his weather," the Canadian airman faces "40 below" as calmly as a Florida pilot takes off in eternal sunshine.

AIR TRANSPORT WELL ORGANIZED

Few people, except those who have seen it, realize the high degree to which northern Canada has organized its air transport. Using water routes, open in summer, it has laid down a wide network of fuel and supply stations at strategic points. All around Hudson Bay, at convenient spots; down the Mackenzie River


0 100 200 300 400 500 600 700 800
STATUTE MILES
LONGITUDE WEST 110 OF GREENWICH
150
140
130
120
110
100
90
80
70
60
50
40
60
50
ALASKA (United States)
YUKON
Yukon
Arctic Circle
NORTHWEST TERRITORIES
FRANKLIN
North Magnetic Pole
MACKENZIE
KEEWATIN
Barren Lands
DOMINION OF CANADA
Good Hope
Norman
Mackenzie
Simpson
S. Nahanni
Flat
Liard
Frances L.
Cassiar Mts.
Devils Canyon
McDame
Dease L.
Stikine
Telegraph Creek
Wrangell
Prince Rupert
Great Bear Lake
Artillery L.
Great Slave Lake
Resolution
Selwyn L.
Dubawnt
Wholdaia L.
Beverly L.
Aberdeen L.
Baker L.
Wager Bay
Chesterfield Inlet
Rankin Inlet
Corbett Inlet
Tavanne Bay
Cape Eskimo
Driftwood Point
Button Bay
Churchill
Port Nelson
HUDSON BAY
Richmond Gulf
James Bay
Hannah B.
Fitzgerald
Fond du Lac
Black L.
Lake Athabaska
Wollaston L.
Reindeer Lake
Reindeer
Waterways
McMurray
Peace
Berwyn
Grande Prairie
BRITISH COLUMBIA
ALBERTA
Ile à la Crosse
Churchill
Lac la Ronge
SASKATCHEWAN
Brochet
Split L.
Nelson
Jackfish Isles
MANITOBA
Sherritt-Gordon Mines
Kississing L.
Flin Flon Mines
Cross
Oxford L.
Gods L.
L. Deer L.
Island L.
Sandy L.
Favourable L.
Norway House
Lake Winnipeg
Red L.
Jasper
Edmonton
The Pas
Saskatoon
Calgary
Regina
Winnipeg
Hudson
L. of the Woods
Sioux Lookout
Vancouver
Victoria
Seattle
Portland
PACIFIC OCEAN
UNITED STATES
ONTARIO
Attawapiskat
Albany
Moose Factory
L. Remi
Cochrane
Timmins
Kirkland L.
Haileybury
Cobalt
Rouyn
Sudbury
Lake Superior
Camp Borden
Ottawa
Montreal
L. Archambault
Grand Mère
Quebec
Roberval
Chibougamau L.
Rupert
Rupert Ho.
Ashuapmuchuan
Saguenay
St. Lawrence
Seven Islands
QUEBEC
Grand Falls
Hamilton
Burnt L.
LABRADOR (Newfoundland)
Nottingham I.
Hudson Strait
Wakeham Bay
Resolution I.
Port Burwell
Davis Strait
GREENLAND (Denmark)
ATLANTIC OCEAN
Belle Isle
Strait of
NEWFOUNDLAND
Anticosti
Gulf of St. Lawrence
PRINCE EDWARD I.
NEW BRUNSWICK
St. John
NOVA SCOTIA
Halifax
MAINE (United States)

Drawn by Charles E. Riddiford

AIRCRAFT ARE MAKING POSSIBLE DEVELOPMENT OF EVEN THE REMOTE CORNERS OF CANADA'S VAST DOMAIN

ONLY THE AIRMAN VISIONS THE FULL SWEEP OF NORTHERN QUEBEC

Inhospitable stretches that until recently meant weeks or even months of toil to men on foot are now conquered in a few hours by light seaplanes. A Fairchild Wasp is shown here carrying photographic equipment over broken country.

FLYERS OFTEN GO TO THE AID OF SNOW-BOUND MINERS

Airmen of the Northern Aërial Minerals Exploration flew 2,000 miles in the dead of winter to pick up a prospecting party at Richmond Gulf (see text, page 624). A pilot and a member of the mining group are shown here with one of the two monoplanes used on the trip.

to Lake Athabaska; about Great Slave and Great Bear lakes and along the Arctic coast, and down the Yukon, these depots are set up. Now practically every district in continental Canada is within flying range of one of these stations. In fact, if you picture the Canadian airways as linked up with the air net in the United States, the broad statement is true, given good weather, that no place on the North American Continent is now more than one or two days' flight from a railway.

It was in survey work and in patrols of her millions of acres of forest reserves that Canada first used planes.* The first attempt to use a plane on a long-distance commercial mission was made by an oil company in 1921. To meet an emergency, they started two all-metal monoplanes, on skis, from the railhead at Peace River on a 1,200-mile flight to Norman, on the Mackenzie River. The weather was vile; blizzards with temperatures of 40 and 50 below zero alternated with mild spring thaws.

EMERGENCY REPAIRS EFFECTED

One plane, landing on crusted snow, at Simpson, broke through so that a ski collapsed and a propeller blade struck the ground. But the resourcefulness of Canadian pilots, in a smash, far from shops and spare-part stores, is revealed in Pilot Gorman's laconic report on this accident:

"March 30. . . . Will try and have a new 'prop' made here. Oak sleigh boards are available; also some glue. And a Hudson's Bay Company man named Johnson is an old cabinetmaker. . . . We can use the damaged propeller as a pattern and use the Catholic Mission workshops here.

"March 31. . . . Found moosehide glue. . . . Borrowed some boat clamps, so that the boards can be clamped tightly together in making the laminated propeller.

"April 15. Tested the new propeller. It works satisfactorily."

The amazing degree to which planes now wipe out miles and save time in Canada was shown by flights and photography work carried on from a base on the north shore of the Gulf of St. Lawrence. From this stormy coast Capt. Vernon ("Turk") Robinson made flight after flight, bearing surveyors and supplies over a mountainous coast line into the interior

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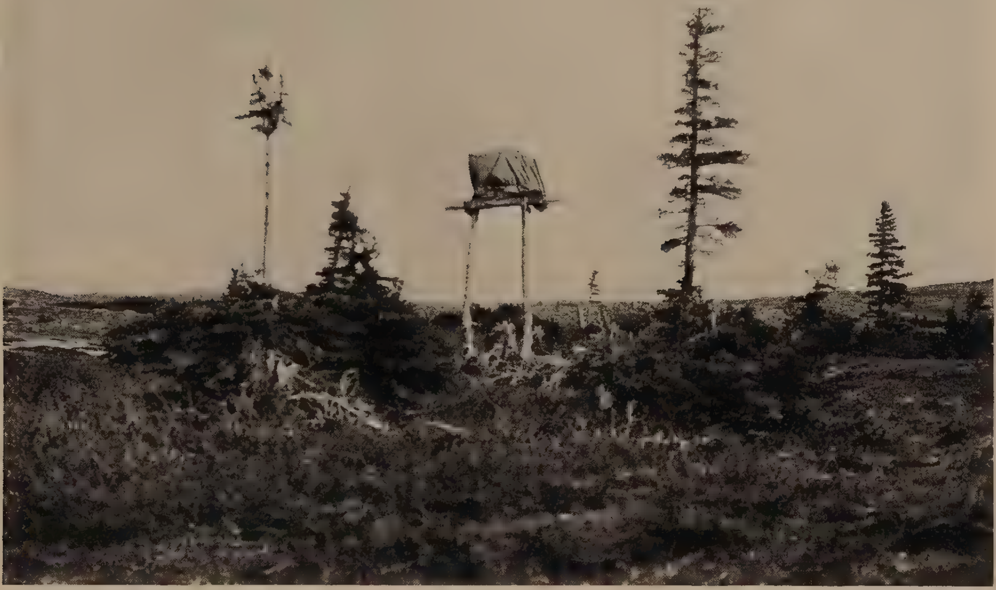
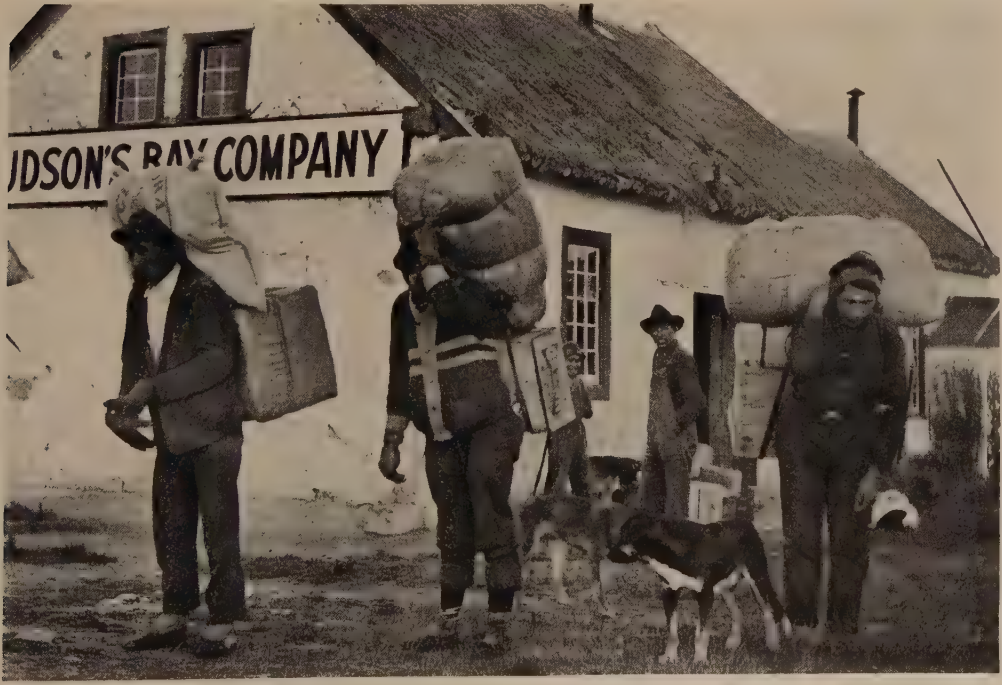
*See, also, "Canada from the Air: Flights Aggregating 10,000 Miles Reveal the Marvelous Scenic Beauties and Amazing Natural Resources of the Dominion," by J. A. Wilson, in the NATIONAL GEOGRAPHIC MAGAZINE for October, 1926.



PROVISION CACHES REST ON STRIPPED POLES

Where storage underground is impossible because of the iron hardness of the frozen soil, the winter food supply must be placed above the reach of prowling animals. This open-air larder stands among the last trees on the edge of the Barren Lands of the Mackenzie District.

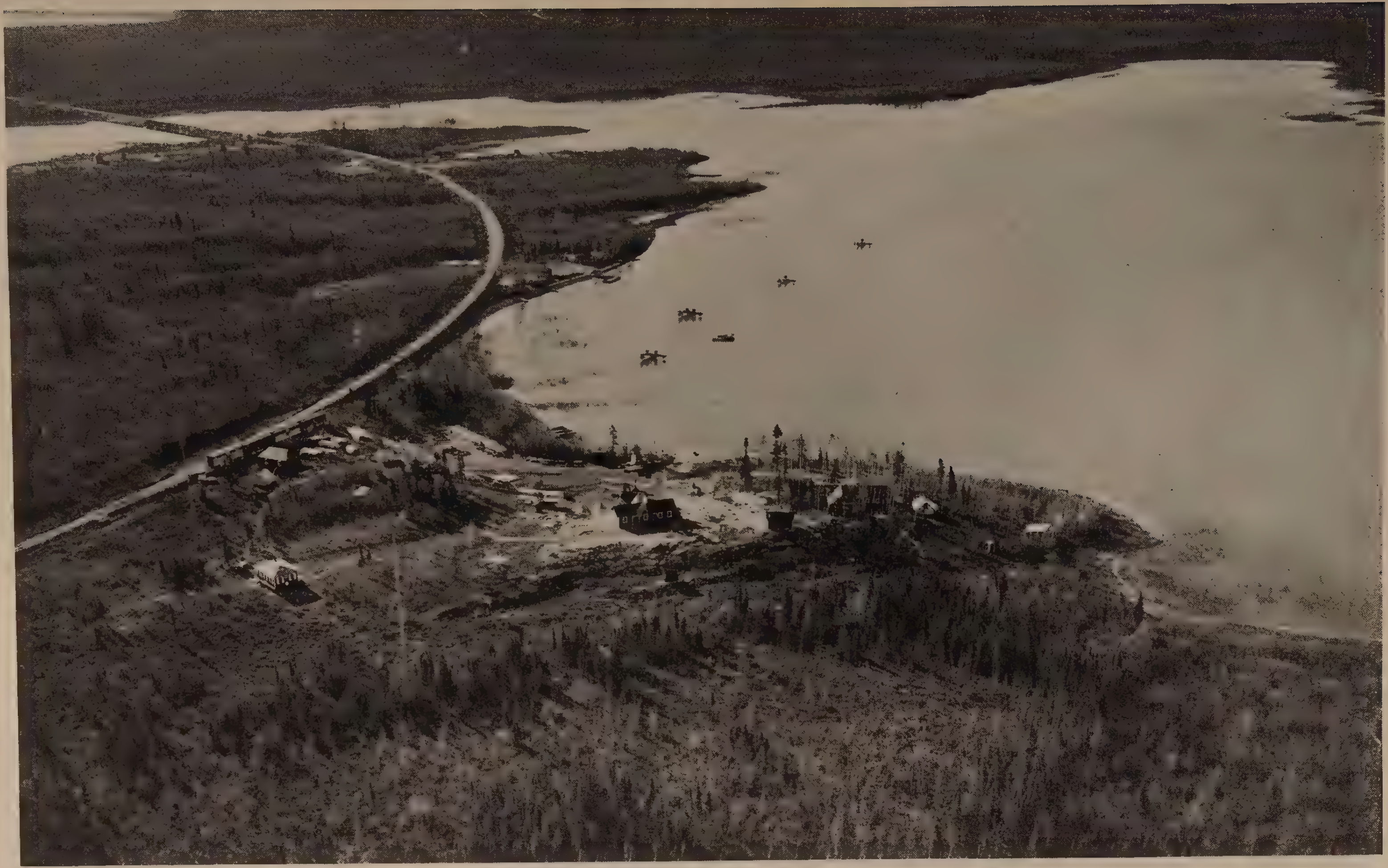


PACKING IS BACK-BREAKING TOIL AT BROCHET

Before the advent of flying in Manitoba supplies had to be transported by man power many weary leagues to the Hudson's Bay post on Reindeer Lake. To-day the goods are brought in by airplane, and the Indian carriers endure the torture of the tumpline for comparatively short distances.

THE SHORELINE OF WAKEHAM BAY LOOKS INHOSPITABLE

Country like this is characteristic along Hudson Strait. It virtually defied exploration until the advent of the seaplane.



RAILWAY AND AIRLINES CONNECT AT CORMORANT LAKE

From this station of the Royal Canadian Air Force, north of The Pas, planes carry supplies to the newly opened mining area of Manitoba. The place is also a fire patrol and survey base.

MANY AIRLINES GO OUT FROM THE PAS

This thriving city of Manitoba is the jumping-off place for planes flying with supplies and passengers to the rich mining fields of the hitherto inaccessible lands to the north.

plateau. He carried drums of gas by air, making caches at points far distant; from these deposits planes could operate even farther inland. Thus Grand Falls, on the Hamilton River, was finally reached. Then, after a day's flight of 800 miles, starting from Burnt Lake, photographs were taken of the falls; and the next day the engineer-photographer was back in Quebec having his pictures developed. By sea and canoe, the only other means of travel, this task would have taken all summer!

Adventure, grim and perilous, is often the lot of pilots and passengers in flight over the long stretches of empty wilderness which intervene between fuel caches, camps, or settlements.

One party, from a base on the inhospitable Gulf of St. Lawrence, was forced down by bad weather and had to alight on an unknown lake. A floating log ripped the bottom from their hull and the flying boat sank. Casting aside their clothing, the crew swam for the shore. They made land minus any food or equipment, and spent a week, naked, in the woods, in the midst of the black-fly season. The days were blazing hot, but the nights freezing cold. Two men, badly hurt in the crash, reached the shore only with the greatest difficulty.

INDUSTRY THRIVES WHERE WILDERNESS WAS KING

An air view of the shaft head of Central Manitoba Mines at Long Lake, near Lake Winnipeg, shows the remarkable development now under way in this rugged district.

Happily, however, in the party was a land surveyor, who managed to swim ashore with a hand ax and a water-tight box of matches. Using his ax, he made a rude shelter. By snaring rabbits in the woods and killing frogs with sticks, the party kept alive for seven days, till rescued by another flying boat sent to seek them.

The search for the lost French flyers, Coli and Nungesser, in May, 1927, nearly cost the lives of Captain Robinson and his crew. They had flown along the north shore as far as the Strait of Belle Isle, then still full of ice, when a storm forced them down. Anchoring late in the evening, in the shelter of a rocky ledge, they curled up in their cockpit to await better weather. Suddenly the wind veered, blowing a gale from the open sea. Their anchor dragged and their ship smashed on the rocks. They saved their emergency kits, made a fire on shore from the wreckage of their plane, and cooked breakfast. Then they walked 20 miles along the beach, to a lighthouse and signal station, to report their whereabouts.

FLYING A SIX-DAY CANOE JOURNEY IN HALF AN HOUR

Returning from a flight up the Ashuapmuchuan River, one pilot brought with

BROCHET SERVES A THRIVING TRAFFIC

Although this airport on Reindeer Lake lacks the latest improvements, it is an important supply base. The plane tied to the pier is refueling for a flight into the empty lands of northern Manitoba.

him an old Indian. When invited to ride, the red man seemed in no way perturbed at the prospect. He calmly donned helmet and goggles and settled himself in the front cockpit, as if flying were an everyday act with him. In a half hour he flew downstream a distance which just previously it had taken him six days to cover by canoe.

On landing he climbed out, stretched himself, and said to the pilot:

"Bon canot! How much him cost?"

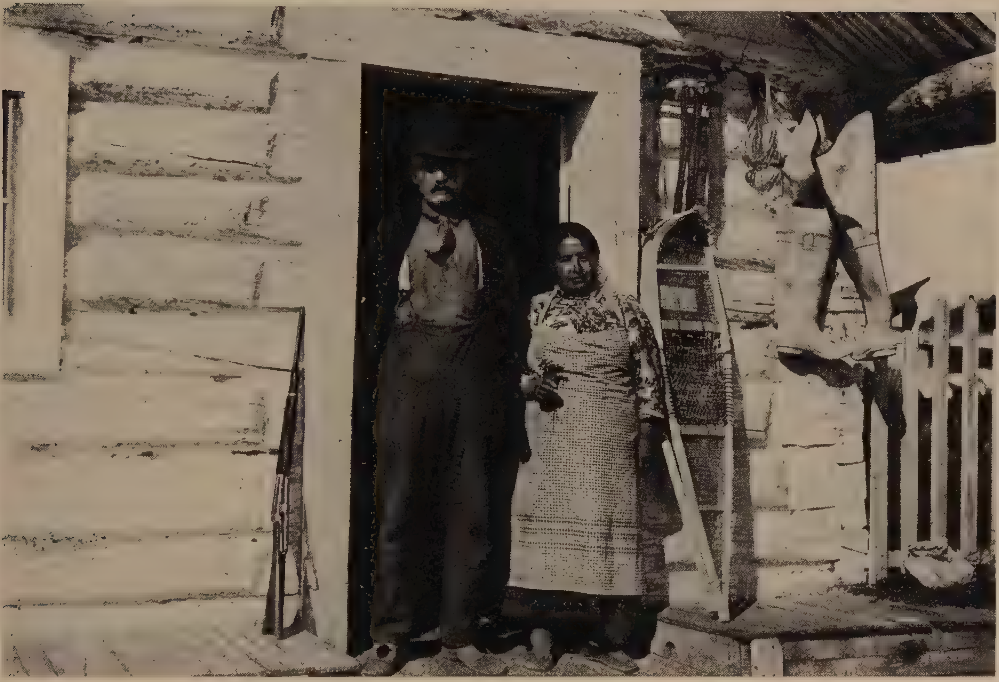
That Indian saw the advantage of air travel in the north country. Undoubtedly he graphically pictured to himself what paddlework he could save for himself and family in their long annual canoe trips to their hunting grounds, if they owned such a "bon canot"!

In north Quebec, flying goes on summer and winter.

On a January morning Capt. Kenneth Saunders, chief pilot of the Canadian Fairchild Company, started north with an engineer and a Hudson's Bay Company official, on a visit to some of the northern trading posts. Unless one flies, it usually takes six weeks of mushing on snowshoes, with a dog team to haul baggage, to reach these wilderness outposts. Regions between posts are wholly uninhabited. Snow lies from four to six feet deep; trails, such as they are, usually follow the lakes and rivers, through a broken country of small timber.

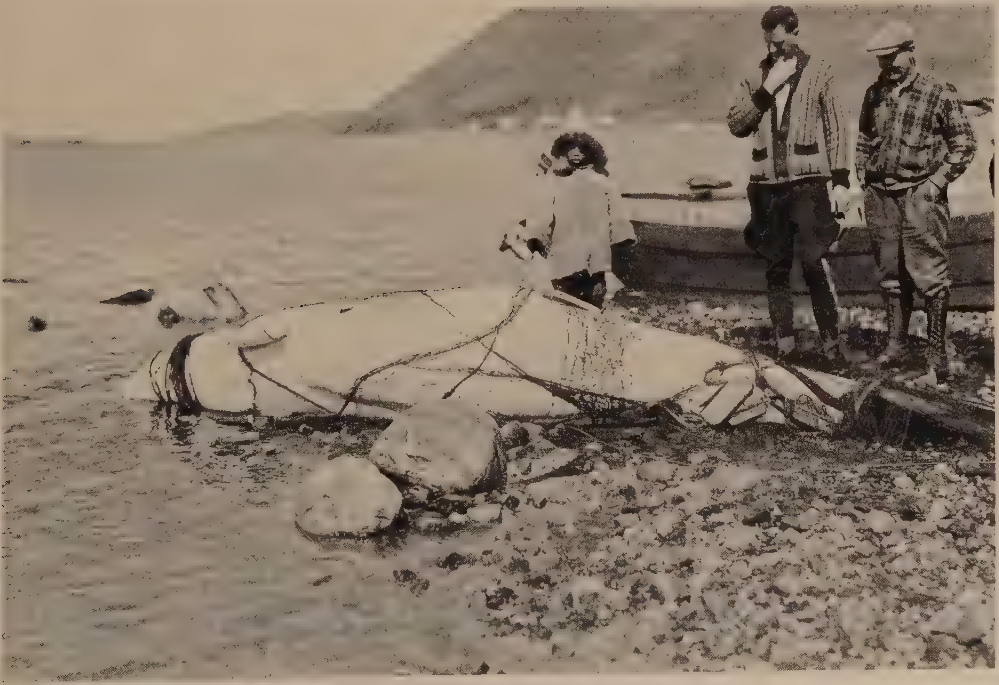
When Saunders and party left Roberval the day was bright and fair, but the thermometer was 25 below. An hour up the Ashuapmuchuan they sighted the first trading post and circled to land on the frozen river. Either they struck a spot where a warm spring had thawed the ice or else an early fall of snow on this ice had prevented a thicker formation; anyway, the plane broke through. The men had barely time to crawl from the cabin before the whole fuselage was under water.

Luckily, they were near the post, and Tom Moar, the Indian in charge, volunteered to walk out the hundred miles to civilization with a message. He started



LURE OF THE NORTH GETS INTO MEN'S BLOOD

The Hudson's Bay factor who stands at the door of his cabin with his Indian wife has lived for 15 years at Liard, one of the farthest outposts of civilization, and disclaims any desire to return to settled country. His early home was in one of the Dakotas.



SALMON NETS SOMETIMES SNARE BIG GAME

To the Eskimo boy of Hudson Strait, the beluga seems a great prize, though it has played havoc with the fishing equipment. The flesh of this small white whale is considered a delicacy by the natives of the north.

THE CORMORANT LAKE SPECIAL OFFERS THRILLS AND CHILLS

Transportation on the Hudson Bay Railway in northern Manitoba seems somewhat primitive, but it is a vast improvement over the pack-train methods of only a few years ago.

away within half an hour, taking only an ax, some matches, and a chunk of moose meat. He made the trip in the record time of five days, sleeping twice, on the second and fourth nights, in a hole in the snow lined with balsam boughs, and traveling continuously the rest of the time.

RAISING PLANE PRESENTS KNOTTY PROBLEMS

Meantime the Canadians set about salvaging their plane. They made a platform of logs around the machine on which to work. As the water was not deep, a tripod of poles cut from the woods was built over the aircraft and its wings were removed.

Seven days later a rescue machine reached the scene with hoisting tackle and tools. The wrecked plane was moved safely to shore. A tent was erected around the front of the fuselage and the engine, which was a solid mass of ice. This ice was chopped out, and then a stove was lit in the tent and gradually the cabin and engine thawed out (see page 636).

The metal propeller, badly bent, was straightened and the engine reassembled. The carburetor, though frozen in a solid block of ice for eight days, again worked perfectly.

On the 6th of February the plane was again ready for flight. Accompanied by the rescue machine, which had made several trips to ferry in gas, provisions, and little gifts for Mrs. Moar and her family (on whose hospitality the crew had been dependent during the salvage operations), it took off safely and flew back to Roberval.

Northern British Columbia is as inaccessible a country as can be found on this continent. Cut off from the Pacific by the panhandle of Alaska, with its coastal mountains and glaciers, it can be reached only by the Stikine, the Peace, or the Liard rivers and their tributaries. The Cassiar, as the district is called, teems with game, and, like all British Columbia, has been for the last 75 years the happy hunting ground of the prospector. Placer gold claims have been worked on many of its streams since the days following the gold strike of '49 in California. The country is now deserted, though undoubtedly

WHEN LANDING IS MADE ON SOFT ICE, EVERYBODY TOWS

For winter flying, seaplanes are equipped with skis instead of pontoons, and sometimes the lakes are not frozen hard enough to support the runners (see text, page 624). This craft got into difficulty on Wakeham Bay while the Hudson Strait Expedition was there, in June, 1928 (see text, page 642).

pay dirt still can be found on many creeks and bars. One hears many stories of lost mines and mystery valleys rich in hidden gold. The scattered Indian population lives by trapping beaver, lynx, marten, wolf, fisher, otter, ermine, wolverine, and fox, all of which are plentiful.

MARVELOUS SCENERY UNFOLDS TO AIR TRAVELERS

In 1925 a successful expedition into the Cassiar and still farther north across the Yukon boundary was organized by Lieut. Col. J. Scott-Williams.

Because this expedition of "flying miners" reveals so dramatically how air travel speeds up industrial activities in northern Canada, the narrative of the Williams party is worth detailing.

He had with him an assistant pilot and three geologists. The latter were hardened prospectors, with a reputation, according to Williams, of being able "to live indefinitely on a rag soaked in moose grease." Three young men, sons of one of the geologists, completed the party.

Their amphibian, rigged at Prince Rupert, was flown up the Pacific coast to Wrangell. Thence it flew over the Coast Range and up the Stikine Valley for 160 miles, to Telegraph Creek.

Staggering scenery slips past on this flight—snow-clad mountains, their lower slopes covered with some of the finest timber in the world, with huge glaciers wedged in high valleys; then the fast-running Stikine, with its many dangerous canyons, in the coastal region. But such terrain makes bad landings for flying boats.

Delayed for days at Telegraph Creek, awaiting the break-up of ice in Dease Lake, its main base, it was not till June 3 that the party was able to leave civilization for the north. Then the outfit of eight men, tents, and other equipment was safely conveyed to the head of Dease Lake over a country devoid of any landing place.

As Dease Lake is 2,500 feet above sea level, it was necessary to discard the amphibian's wheels, owing to the heavy loads carried, and use her as a boat only. From the lake the party then flew 90 miles far-

A LANDING LAKE LIES NEAR THE HEADWATERS OF THE NAHANNI

Here is the "land where the mountains are nameless and the rivers all run God knows where." Captain Oaks took a party of prospectors into this virtually unknown country, on the border between the Yukon and Northwest Territories (see text, page 623).

ther north, a 12-day trip by canoe, but 50 minutes only in the air, to McDame's, a Hudson's Bay post. Miners dredge for gold in the creeks of the vicinity.

Here Williams chartered a 5-ton scow and had it brought to the head of Dease Lake, where it was loaded with gasoline, supplies, and equipment and sent down the river to Liard, a 20-day trip, to establish an advance base there. While the scow was en route the geologists prospected around McDame's and Dease Lake, going and coming by air (see page 623).

July 5 they moved on to Liard base. Their plane's arrival caused great excitement. Natives fired a *feu de joie,* and in his excitement one shot a 30-30 through the plane's hull, just back of the gas tanks, causing a fountain to shoot up through the hole.

For two weeks the plane ran excursions within a radius of 250 miles of the post, the geologists landing here and there to explore. On one occasion Williams carried seven men, provisions and supplies to last a month, including tents and mining equipment, a distance of 200 miles, over absolutely virgin country, with no trace of human habitation.

VAST REGIONS ARE ENTIRELY UNPOPULATED

In August a flight was made from the main base at Dease Lake to Frances Lake, a distance of 310 miles, and about 130 miles north of the Yukon-British Columbia boundary. No white men or Indians were found living at Frances Lake, though there were the remains of an old Hudson's Bay post on the shore. The whole district teems with game. There are moose by the dozen on the shores of small lakes, while on the ridges of the mountain caribou, goats, and grizzly bears can be seen at almost any time. In captivity, at the Hudson's Bay post, there is a white moose caught thereabouts. Indians say that these freaks are fairly common in the district. White beaver and white bear are also frequently seen. Much merchantable timber stands in the rolling country between Cassiar and the Rocky Mountain ranges.

A MERRY HEART KNOWS NO WINTER

Golf at Wakeham Bay offers snow hazards even on the fairways, but the sand traps are harmless under several feet of ice.

NEWS FROM "OUTSIDE" GOES NORTH BY AIR

This monoplane of the Western Canada Airways made the first flight with mail from McMurray to Simpson.

SHELTERED COVES PROVIDE SANCTUARY

The planes shown here at rest on Lac la Ronge, Saskatchewan, are engaged in the important business of forest patrol. Though fires still do considerable damage in this district, aircraft have greatly reduced the annual losses.

Before returning to civilization this expedition visited the so-called "tropical valley" north of the Liard River, near Devils Canyon. The explanation of this phenomenon is that vapors from a large number of hot springs in the valley ward off severe frosts, with the result that the vegetation is of a size and rankness entirely out of keeping with this cold northland. An interesting example of this was found in one old garden, deserted by some unknown trapper or prospector years ago, wherein imported vegetables, flowers, and fruits still flourish.

This isolated region is undoubtedly rich in mineral wealth, in water power, and in forests. When brought into closer touch with civilization, it will become very productive. At present its remoteness is a great handicap, and if it were not that game is plentiful, living would be practically impossible. Flour now costs $27.50 a hundredweight; sugar, beans, and rice, $40 a hundredweight; butter, tea, and coffee, $1.50 the pound.

Flying from Liard post on the morning of August 28, the party returned at noon and landed the same day in Wrangell. In the afternoon they covered the 400 miles to Prince Rupert, after three months away from civilization, on what was probably the first extended exploration tour of this kind that was ever undertaken.

In 1924 mining development began in

NORTHERN CANADA HAS UNTOLD RICHES OF "WHITE COAL"

Since air traffic has opened the gateway to hitherto inaccessible lands, it is a question of only a little time until many unknown torrents will be harnessed. Great Falls dam and power plant on Winnipeg River in Manitoba.

the Rouyn district, and the first organized air transport route of the kind was then established by the Laurentide Air Service. More than 1,000 passengers, 80,000 pounds of freight, and thousands of letters and telegrams were conveyed from the railway at Haileybury into this camp during the year.

That summer a little city of tents and log shacks grew up in the forest many miles from any settlement or railway. To-day it is the center of one of the largest mining developments in the Dominion. The Noranda mining corporation's smelter is now in full blast and a model city has been built near the mine, complete with water supply, electric light, railways, and roads. The whole district is now a hive of industry. Many other mines are being developed and active prospecting, aided by airplanes, is being carried on all through the district. On such services an extraordinary variety of material is carried by air,—as one pilot expressed it, "everything from pigs to ice cream." An uninitiated passenger, inquiring whether this description was serious, was assured, "Why, certainly. The most regular freight we get into Rouyn from Haileybury is a barrel of ice cream on each afternoon trip, while, as for pigs, at mining camps there is always lots of waste food, and it pays us to

THE PAPOOSE HAS NOT MUCH FREEDOM OF ACTION

When the squaw comes to Churchill to see the railway construction work, she brings her children, the youngest in a cocoonlike bundle, which is carried on her back while she is on the trail.

buy a few piglets, take them in by air, and grow our own bacon and pork."

Air transport, too, played its part when the important gold strike was made in the Red Lake district of northwestern Ontario. Development has been slower there; no railway yet penetrates that district. But each season sees new camps and fresh finds. A 500-ton mill is being built at the Howey mine and others are contemplated.

Planes have been and still are much used to supplement slower transport by road and river. A steady stream of men, material, and mail travels by air to and from the railway at Sioux Lookout, or Hudson, and the mining camps to the north. In 1926 Capt. H. A. Oaks, with his little two-seater, on floats in summer and skis in winter, carried 260 passengers, 14,000 pounds of freight, and 3,000 pounds of mail.

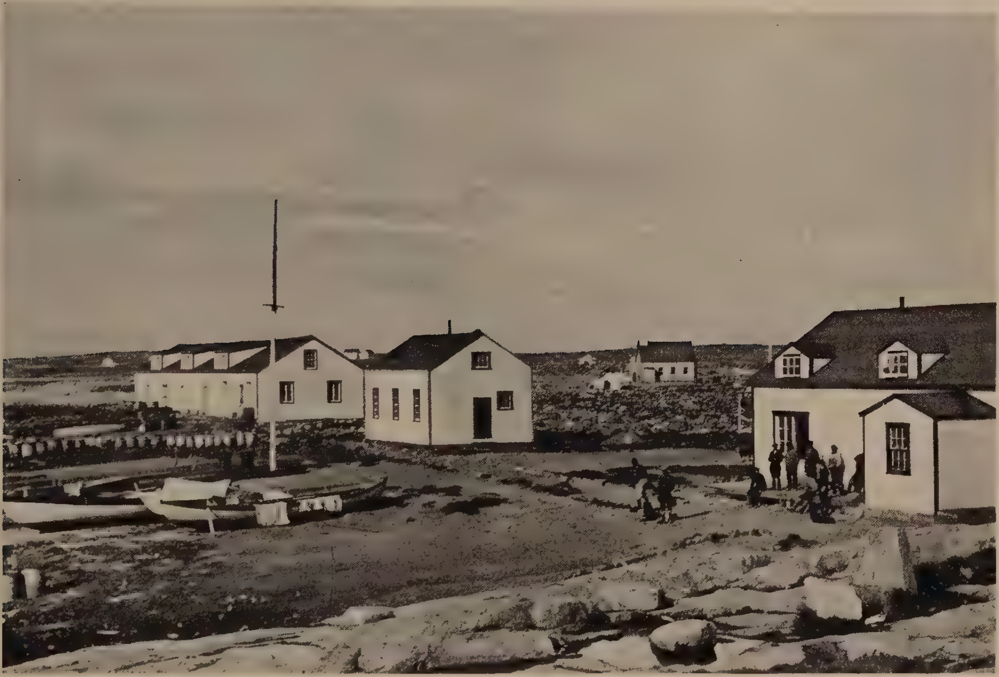
Oaks has been a leader in the organization of air transport as applied to mining exploration and transport in the north. He gained the Distinguished Service Cross on the western front, where he was wounded while fighting with the 48th Squadron, R. A. F. A mining engineer and geologist by profession, he had the advantage of seeing this development from both sides. He knew intimately the requirements of the field geologist and the possibilities and limitations of aircraft.

He had served for two years as pilot with the Ontario Air Service and was on forest patrol in the Red Lake district to assist in coping with the greatly increased fire hazard consequent on the rush of prospectors after the gold strike there. Recognizing the need for better transport to speed up development and make the commercial air service self-sustaining, he resigned his Government position when the snow came in the fall and the fire season was over and began work as a common carrier of the air.

He organized Western Canada Airways to cope with the rapidly increasing demand for aircraft in that district and in northern Manitoba. As an example of the kind of air work on which this group is now engaged, the following narrative is interesting:

WINTER NO LONGER SHUTS OFF THE NORTHLAND

The Department of Railways and Canals had called in a London engineer to report on the best location for the railway terminus and harbor works for the Hudson Bay line. Preliminary to his visit to Canada to inspect the natural conditions at Port Nelson and Churchill, this engineer asked for full information, with

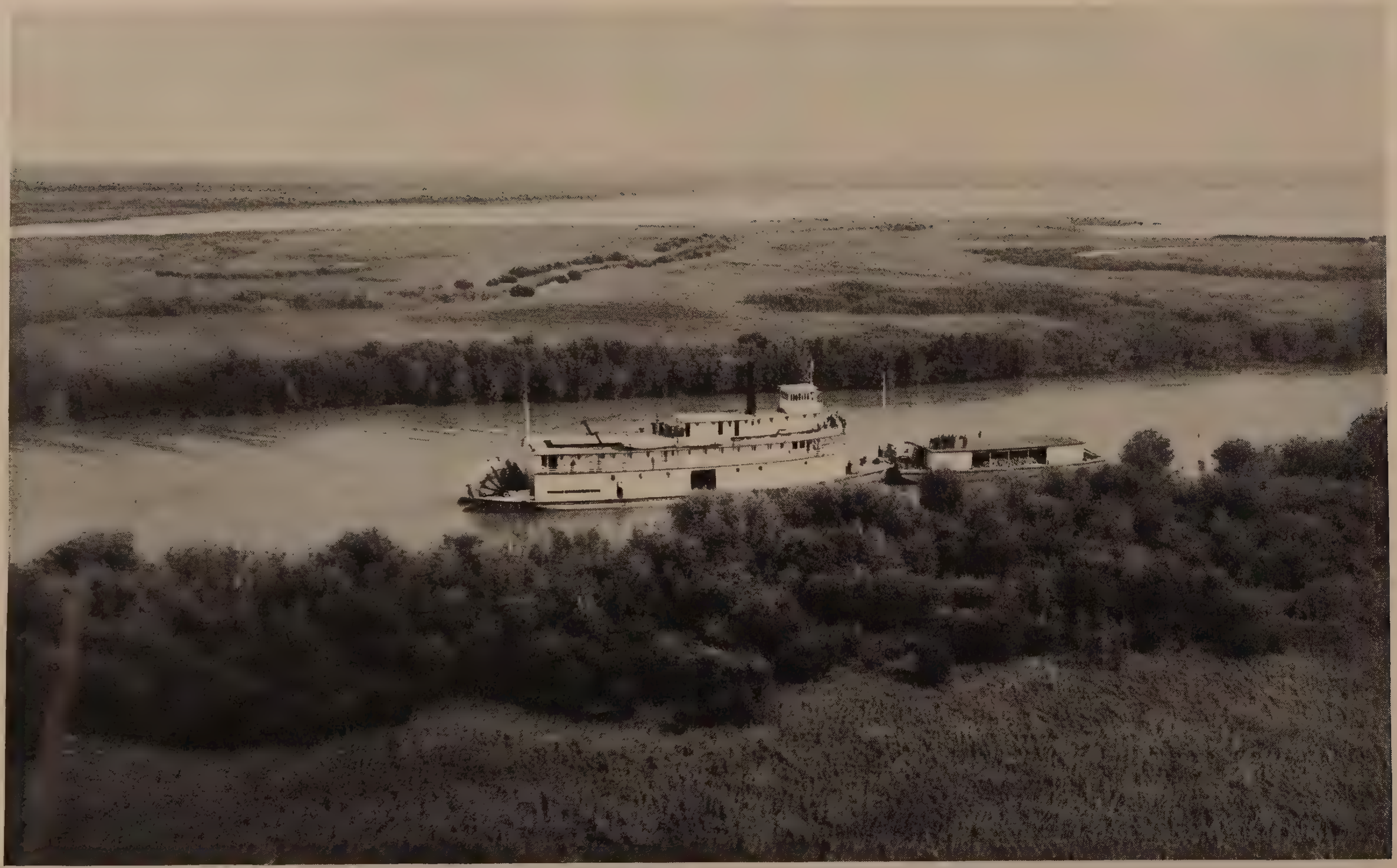


FAR-FLUNG TRADING POINTS ARE NO LONGER ISOLATED

To Chesterfield Inlet, in the remote Keewatin District, airplanes now wing their way, bringing the Hudson's Bay post and mission within a few hours of railroads and markets.

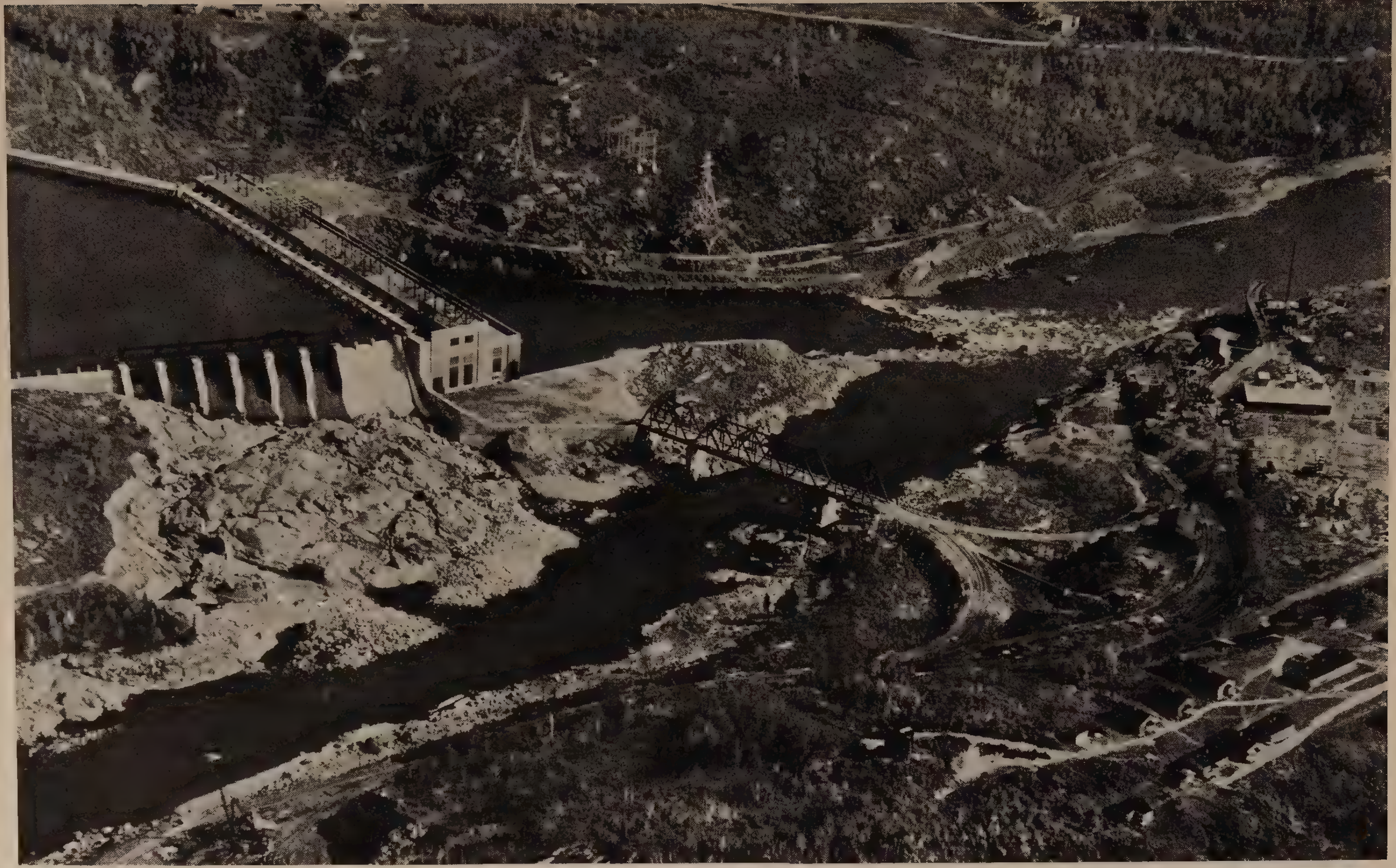
EMULATING ELIZA MAKES GOOD SPORT ON WAKEHAM BAY

The doctor of the Hudson Strait Expedition is out for a bit of exercise on the breaking ice where a slip or misstep would mean a cold plunge.



CONSIDERABLE TRAFFIC MOVES ON THE SLAVE RIVER

The Steamship *Athabaska* plies between McMurray and Fitzgerald, Alberta, in the heart of a country rich in vegetation.



DEVELOPMENT GOES ON APACE IN THE NORTH

Tremendous resources are being opened by the dam and power plant on the Saguenay River, Quebec. Within a few years such projects will be under way in far districts now accessible only to aircraft.

FOR LAND TRAVEL DOGS ARE INDISPENSABLE

When snow blankets the Northwest Territories, the malemute or husky comes into his own. This team hauls supplies to a lonely trading post.

HOSPITALITY SAVES LIFE IN NORTHERN QUEBEC

Had it not been for the kindness of Tom Moar and his family, Captain Saunders and his two passengers would have perished when their monoplane broke through the ice of Ashuapmuchuan River. The Indian trader fought his way on snowshoes through 100 miles of wilderness to bring assistance, while the air adventurers were made comfortable in his cabin (see text, page 608).

WAKEHAM BAY LOOKS COLD AND FORBIDDING

Base C of the Hudson Strait Expedition lay in the heart of the winter lands. Operations went on here for more than a year.

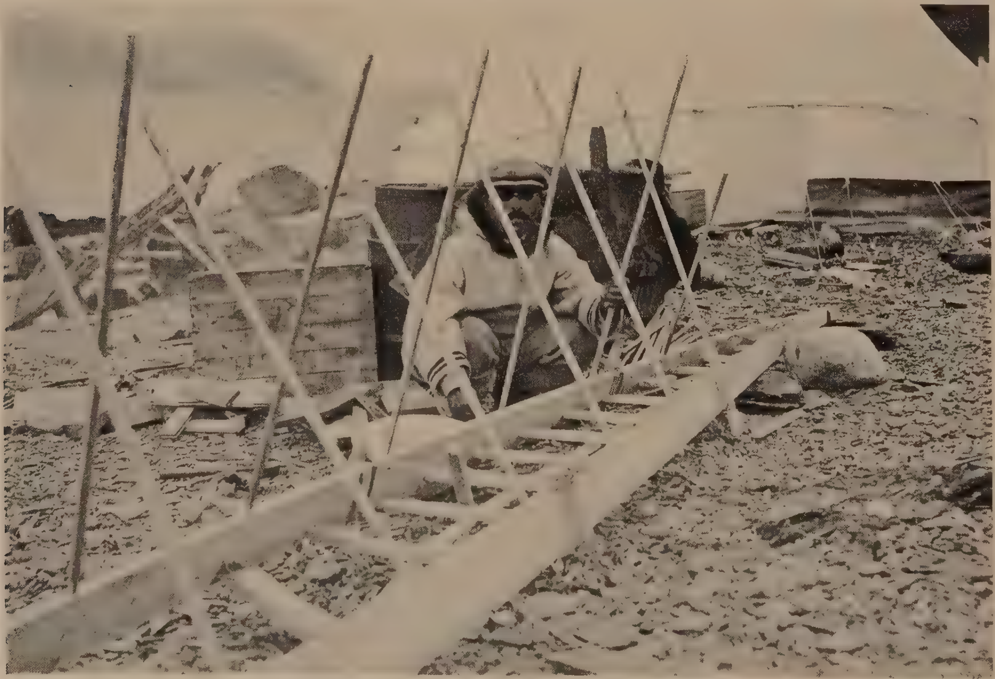
maps and charts of the two locations. These were furnished. But in December, 1927, it was found that no data were available on the nature of the subsoil at Churchill, and that borings would be necessary.

Churchill was then icebound and separated from the end of steel on the railway by 280 miles of grim frozen waste, where there was no road and no habitation. Access by sea was impossible for six months. The Department of Railways and Canals then sent for Captain Oaks and offered him a contract for the conveyance of machinery, supplies, and the personnel of the party. Captain Oaks accepted it and left the same night for New York, where he purchased two Fokker planes. Delivery was obtained in the first week in March. The machines, equipped with wheels for landing, were flown from New York to Camp Borden, Ontario, where the wheels were replaced by skis. From Camp Borden the planes proceeded west right through northern Ontario to Sioux Lookout; thence across the lonely forest land of eastern Manitoba to Norway House, where they refueled, and thence to the end of steel, near Split Lake, where the engineer party, with its equipment, was waiting (see map, page 600).

In three weeks Oaks was back at his base at Sioux Lookout, having carried

FLOWERS DELIGHT ESKIMO CHILDREN

These boys are gathering the wild blossoms that grow in profusion around Wakeham Bay, base of the Hudson Strait Expedition.



ESKIMOS SHOW SKILL AS BOAT BUILDERS

When the Hudson Strait Expedition reached Wakeham Bay, Quebec, the seaplanes landed on waters that seldom harbor craft larger than the kayak. It takes a native to construct and navigate one of these tricky canoes.

twelve men and 15,000 pounds of material to Churchill. There borings were made and the desired data obtained nine months earlier than would otherwise have been possible. The prompt decision to locate the railway terminus at Churchill was dependent on this information.

Another similar operation was the conveyance by air of 40 men and 35 tons of supplies, including diamond drills, required for the development of the Sherritt-Gordon claims in the Cold Lake district, one hundred miles or more from The Pas. By taking this equipment in by air, the mining group was able to prove its mineral deposits and proceed with the building of a railway to its claims many months ahead of schedule.

A SEAPLANE RIDES THE WAVES ON DEASE LAKE

This base of the expedition that carried three prospectors into the Cassiar and Yukon country in 1925 lies 2,500 feet above sea level (see text, page 611).

For his work in organizing air transport in the north, Captain Oaks was awarded the McKee Trophy for 1927. This is given each year in Canada to the person who performs the most meritorious service in the advancement of civil aviation in the Dominion.

DEVELOPMENT OF MINERAL RESOURCES PROCEEDS APACE

Captain Oaks's chief interest is mining, however, and he joined with Mr. J. E. Hammell, one of the most experienced prospectors in the north, in the formation of the Northern Aërial Minerals Exploration in the beginning of 1928. Their interest is primarily mining exploration and not commercial aviation, but they specialize in the use of aircraft for the transport of parties and their maintenance in the field.

The captain's log book for 1928 is an unparalleled record of travel at all seasons through northern Canada. In August he was at the headwaters of the Nahanni River, on the divide between the Yukon and the Northwest Territories, following up a story of a rich placer strike and murder mystery which has been a lure to miners for years (see page 612).

Oaks first heard the story when he was on his way to the Norman oil field, in 1921, and tried to get a syndicate together to follow it up. With the aircraft and engines then available, this was not

SMOOTH SNOW MAKES AN EXCELLENT LANDING FIELD

Pilots Oaks and Reid found conditions not impossible on their winter flight from Remi Lake to Richmond Gulf (see text below).

possible. Lieutenant Colonel Williams approached it from the Pacific in 1926 and Captain Oaks from the east by the Mackenzie Valley route. Oaks describes the area as "a hunter's paradise." The valleys are well wooded, the streams full of trout and grayling, and the woods full of moose, caribou, black and grizzly bears, with goats and sheep in the mountains. There are many hot springs, similar to those reported by Williams in the valleys, and the captain declares it an ideal location for a "dude ranch."

While on the Nahanni, Oaks thought it best to call in a supporting machine, and summoned one from Winnipeg by the wireless service maintained in the north by the Royal Canadian Corps of Signals. Captain McDonough received the message at lunch time in Winnipeg and left about 3 o'clock in the afternoon. Refueling at Ile à la Crosse and Fitzgerald, on the Slave River, he had supper with Captain Oaks at Simpson next evening.

McDonough, alone in his Fokker, had to attend to his own refueling and mooring. When one considers the distance he traversed, 1,400 miles, cross country, in little over 24 hours, and the wilderness flown over, this cruise constitutes a very remarkable record for an ordinary commercial aircraft.

Having met, the two planes took their prospector passengers and camp outfit up the Liard and the Nahanni to its junction with the Flat River. By September 15 they were forced by coming freeze-ups to return to civilization. Severe cold and snowstorms were met with on the return journey, but Edmonton was reached in safety on September 23.

WHEELS GIVE WAY TO SKIS

Skis must be used in winter. In the Christmas holidays Captain Oaks and Pilot Pat Reid, each with a plane, left Remi Lake, on the Canadian National Railway, on a trip up the east side of Hudson Bay as far as Richmond Gulf. There they had a rendezvous with a prospecting party which had been left there by a schooner during the summer to be picked up by plane in January (see page 602).

Oaks and Reid were accompanied by two honeymooners, an Anglican missionary and his wife, who desired to return to the mission station at Rupert House. By dog team this trip would have taken six or eight weeks for the outward journey alone. There are only five settlements between the railway and Richmond Gulf, and the route lies over several hundred miles of the rocky, eastern shore of James and Hudson bays, fully exposed to

WINTER HOLDS NO TERRORS FOR THESE "GRASSHOPPERS"

Though the monoplanes resemble the improvident insect of the fable, they weathered the cold of a January flight without serious mishap.

the sweep of the Arctic gales over the open waters.

An hour's flying brought them to Moose Factory, where they left the mail. In fine weather they hopped for Rupert House. But, without warning, a blinding snowstorm swept down on them while they were crossing Hannah Bay. Visibility was *nil*. They flew over Rupert House without seeing it and landed on the coast seven miles north an hour before dusk.

The two airplanes had become separated in the storm, and Reid landed about the same time, on the ice three miles offshore. To prevent his machine being blown away, he immediately froze his skis to the surface ice. He and his mechanic then made themselves comfortable in the cabin till the storm should pass.

Oaks, with the honeymooning passengers, taxied to the shore to find a sheltered spot to spend the night. While doing so they broke a ski. But the brave bride cooked emergency rations for supper over a blowtorch and all settled down for the night.

In the morning things looked hopeless. It was 40 below and blowing a steady blizzard. The plane was disabled and frozen in. Oaks set out on foot to locate Rupert House. After tramping miles along the coast, he recognized a landmark and realized that he was north, and not south, of the post. Retracing his steps to the plane, he found that an Indian trapper had passed by and had taken word to Rupert House. About midnight, on New Year's Eve, a dog team arrived for the newlyweds and took them home to the mission.

The weather cleared next day and repairs were made to the ski by a blacksmith from the mission station. Then both planes were unfrozen and the trip was continued to Richmond Gulf, where the prospectors were picked up.

MISHAPS WERE INFREQUENT

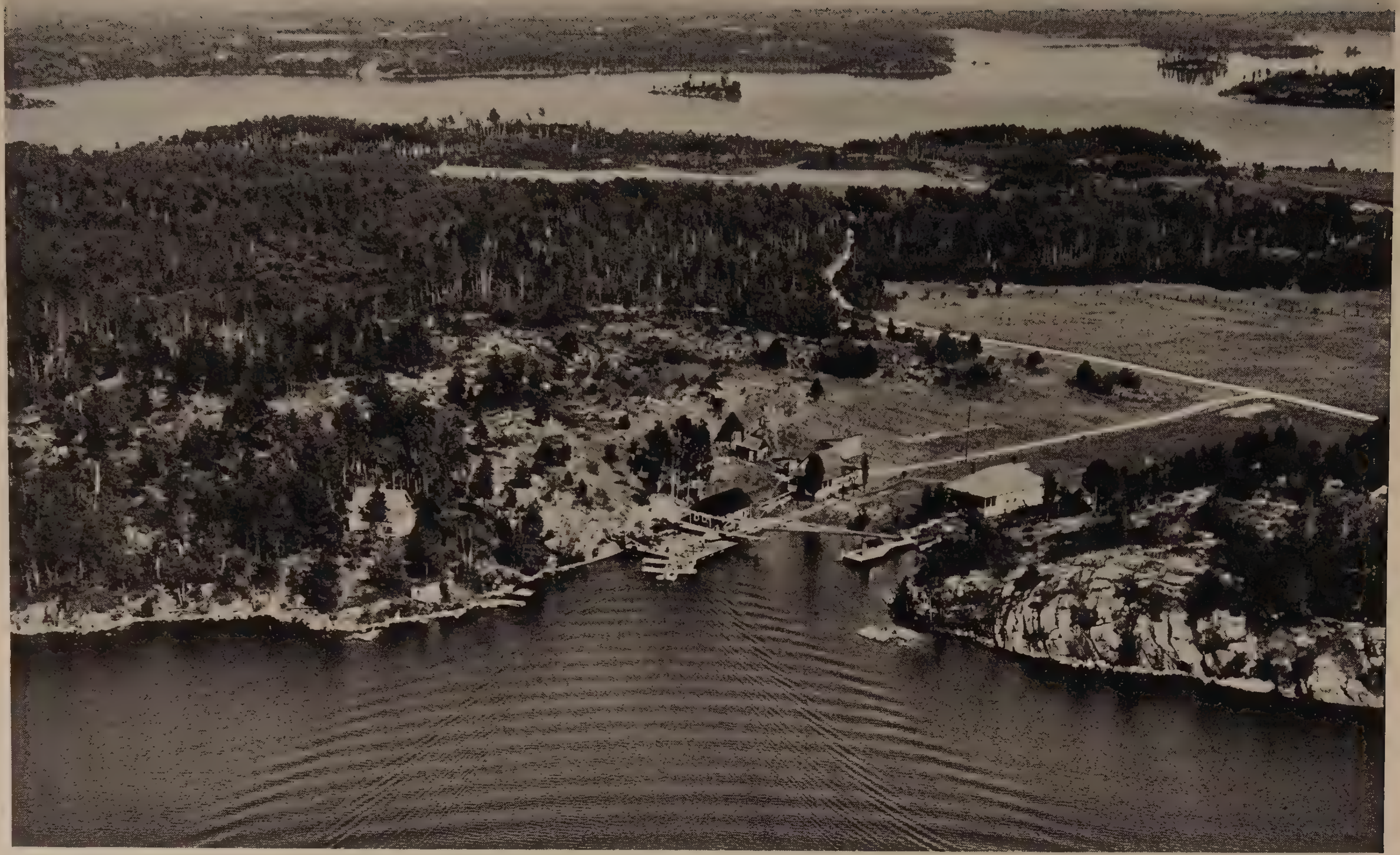
Many similar flights by pilots of the Northern Aërial Minerals Exploration could be recounted. Captain Berry spent the summer on the inhospitable shores of Baker Lake ferrying prospectors around the district as far north as the divide, into Wager Bay. His brief tale of conditions there is heartbreaking—constant gales and blizzards, low banks with little shelter, moored aircraft dragging their anchors and having to be beached on rocky shores. Coming south in October, just before the freeze-up, Berry landed to refuel at Churchill. Ice floated in the river; it was bitter cold and blowing a gale, with a heavy sea running. It was imperative to leave before the ice "took." As the plane

ACCIDENTS BRING OUT RESOURCEFULNESS

When a propeller is broken or twisted, the adventurers of the air perform miracles of repairing with the crude materials available in a land where smithies are few (see, also, text, pages 602, 633).

WINTER FLYERS MUST BE HARDY

The expedition which flew in midwinter from Remi Lake, north Ontario, to Richmond Gulf, on the east shore of Hudson Bay, experienced the rigors of severe Arctic weather (see, also, text, page 624).



LAKES ARE THE FLYING FIELDS OF THE WILDERNESS

In the rugged country of forests and mountains, where landing on the ground is perilous, aircraft are equipped with pontoons in summer and with skis in winter. Sudbury, on Ramsay Lake, is the seaplane base for the Provincial Air Service of Ontario.

PLANES CARRY EVERYTHING ON THE QUEBEC FRONTIER

Passengers are shown here at Rouyn embarking for the regular flight to Haileybury. Supplies for this remote mining district, from pigs to ice cream, come in by air (see text, page 615).

STANLEY MISSION SERVES AS A REFUELING STATION

This base on Churchill River north of Lac la Ronge, northern Saskatchewan, supplies aircraft for long flights over untouched wilderness.

ONLY SEAPLANES CAN ALIGHT IN NORTHERN QUEBEC

In this characteristic country of the Lake Archambault district the numerous placid lakes are the only safe landing fields. Here is a vast stretch of virgin timber of enormous value.

taxied to take off, the heavy seas damaged a float. The aircraft turned over and had to be beached. No one was injured and no property lost. It is remarkable, under such conditions, that this was the only major loss sustained in the north in 1928, all through hundreds of hours' flying, by scores of aircraft (see page 631).

The air-transport business of Western Canada Airways has continued to expand, and the company now owns 35 aircraft of the latest types, from trimotor Fokkers to Moth light aircraft. It operates all through northwestern Canada. Wherever there is freight to carry or men to be flown, it will undertake the job. In two years it has built up a business which, with the exception of that of the great air-transport companies operating on the main air-mail routes in the United States, is without parallel in the world for an unsubsidized, purely commercial venture.

Many of the most resolute and experienced pilots now engaged in northern work served their apprenticeship in remote flying in the ranks of the Provincial Air Service of Ontario.

G. A. Thompson, pioneer flyer down the Mackenzie Valley, is in charge of operations at The Pas. His record in 1928 covers 22,000 miles, flown on a Wasp-engined Super-Fokker. No repairs of any kind, except for two changes of spark

NORTHERN MANITOBA HAS VAST MINERAL WEALTH

Preliminary development is well under way at the Sherritt-Gordon mines, in a district isolated from the world were it not for the airplane. A branch railway from the Flin-Flon line is being built to this field (see, also, text, page 599).

plugs, were made. His itinerary included trips to Corbett Inlet via Churchill and Cape Eskimo, bringing out prospectors for one of the mining companies.

MISSING PROSPECTOR FOUND BY AVIATOR

He writes: "The Barren Lands are well named, and I can't imagine a more desolate spot or one more void of landmarks. From a pilot's point of view, you could not operate in a worse country. From Churchill to Corbett Inlet I did not see one good sheltered harbor in which a machine could ride out a storm; the coast is low and rocky, with hidden reefs for several miles out, which are exposed at low water."

One of Thompson's achievements was the successful search for Andy Taylor, a prospector who, on June 26, was reported missing in the Cold Lake district, north of The Pas, and was not found till August 14. When rescued he was almost at the end of his tether, weak from starvation after living for many weeks on berries.

Another of Canada's pilots, Capt. C. H. Dickins, D. F. C., who served on photographic operations in the prairie provinces and whose work in this field excited much attention, made a most remarkable flight, carrying prospectors. His cargo included an air mechanic and two passengers, with complete camping outfit, emergency rations, and collapsible canoe.

THE MOTOR AGE HAS REACHED HUDSON STRAIT

To the natives at the Wakeham Bay base, whose only means of transportation over the snow and ice is the dog train, a caterpillar tractor, used to tow the monoplane to the runway, seemed almost as strange as the "flying canoe."

LOSSES HAVE BEEN AMAZINGLY FEW IN NORTHERN FLYING

To escape being frozen in at Churchill Harbor, Captain Berry was forced to take off in a storm and his plane was wrecked; but no one was injured and the aircraft was salvaged (see text, page 625.). This accident was the only serious mishap of 1928.

REINDEER LAKE IS AN ANGLER'S PARADISE

When the larder at Brochet, Manitoba, runs low, it is easily replenished with delicate trout and whitefish or the gamy muskellunge.

The route was from Winnipeg to Churchill; thence to Chesterfield Inlet, west to Baker Lake, and southwest to Lake Athabaska by the Dubawnt River; thence north to the Great Slave Lake country and back to Winnipeg via Lake Athabaska, Black River, Wollaston and Reindeer lakes, Reindeer River, and The Pas. The distance covered was about 3,960 miles, yet flying time was only 37 hours. The party was absent from civilization for 12 days. No effort was made to break any records and the trip was purely one for studying the possibilities of prospecting by air. By a land route such an expedition would have meant at least two seasons' travel and much hardship.

The explorers' description of Chesterfield Inlet is absorbing. It is a magnificent waterway extending 300 miles inland. Baker Lake joins it to the west, and quite large schooners can be navigated to the west end of the lake. Around Chesterfield Inlet and Baker Lake the country is much more rugged than farther south. One hill near Baker Lake stands out for miles, a wonderful landmark for air pilots.

At the junction of the inlet with Baker Lake there are "reversible falls," similar to those at St. John, New Brunswick. The shallow bottom and rise and fall of the tides cause this phenomenon. The party spotted at least one magnificent water-power site on the shore, where a large, unnamed river falls at least 200 feet.

Captain Dickins's report on his long flight across the Barren Lands to Lake Athabaska by the Dubawnt River, over country which has been traversed only once or twice by white men, reads as follows:

"On September third we left Baker Lake and followed up the Thelon River to Aberdeen and Beverly Lake, then south by west up the Dubawnt River to Dubawnt Lake, and on through a chain of lakes to the height of land and to Fond du Lac at the east end of Lake Athabaska. This was over the real Barren Lands, and from the time we left Baker Lake we never saw a living thing until getting near the tree

NO CITY CHEF CAN BETTER CAMPFIRE COOKING

With the keen air of the north to sharpen the appetite, who could think of an aroma more delicious than that of coffee and bacon?

line again, when a few birds were seen. The tracks of caribou could be seen here also. The maps I find are fairly accurate of this route down to Dubawnt Lake, but from there on practically useless. There is a great maze of lakes all over this country, and a good seaplane route. Nearing the height of land the lakes get smaller, but are quite large enough for any machine the size of the Fokker. The height of land is very clear and is a good landmark. I flew by the sun most of the way, as the compass goes around in circles in several places, and the last hundred miles the visibility was very poor, owing to smoke. Wholdaia and Selwyn lakes do not look anything like the map, and both lakes are much larger than marked, with many bays and inlets. The best landmark on this route is the height of land."

DRIFTLESS AREA A PROSPECTOR'S PARADISE

Here is the real "barren land." But apparently it is a prospector's paradise, since the rocks are clear of drift. From the preliminary survey made of the rocks, geologists predict that when the country can be thoroughly prospected, the mineral deposits will be found to be very much more widespread than has been supposed.

Last winter Dickins pioneered a weekly mail, passenger, and express service—a regular "air accommodation train"—from the end of steel at Waterways, Alberta, down the Mackenzie basin to Simpson, with occasional trips to Norman and Good Hope, the latter almost on the Arctic Circle. On his first landing, at Resolution, he ran into rough ice and wiped off the undercarriage of his Fokker. The metal propeller was also badly damaged. Nothing daunted, he and his mechanic rebuilt their landing gear with some pipe and iron rods obtained at the post, straightened out the propeller, cutting eight inches off one tip to balance the other, which was broken, and then flew the monoplane out to the railway again.

A short press item may be quoted as typical of Dickins's work in this service:

"An auction sale of $75,000 worth of furs in Winnipeg on March 14 was interesting, in view of the fact that the furs had left Fort Good Hope, 1,600 miles

NATIVES LAUGH AT THE RIGORS OF THE ARCTIC

The Hudson Strait Expedition gave employment to many of the hardy dwellers of the Port Burwell region. They proved strong and willing workers.

MEAT-CURING IN THE NORTH REQUIRES LITTLE EQUIPMENT

"Jerked," or dried, caribou flesh is a staple food in the north. This outdoor "smokehouse" is on the shore of Artillery Lake, in the Mackenzie District, northeast of Great Slave Lake.

Photograph by Arthur Pike

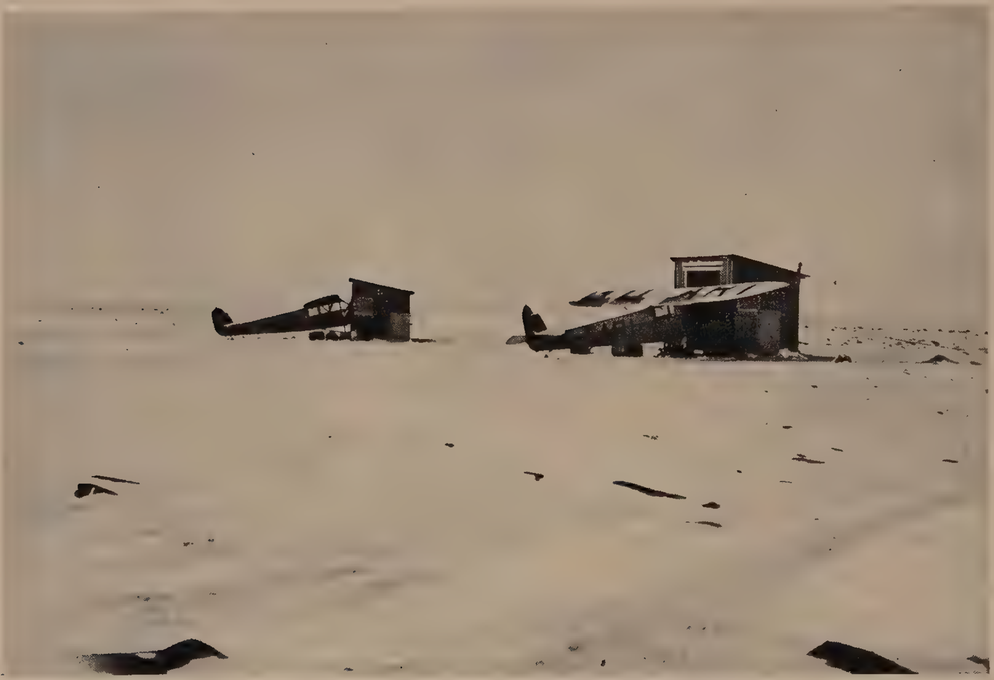
CARIBOU SWIM THE YUKON IN HERDS

Driven to the river every autumn by bears and other beasts of prey, these animals fall easy victims to the Indian hunters, who slaughter them in great numbers and store their meat for winter use.

north of Edmonton and on the rim of the Arctic Circle, only 4 days previously. Pilot Dickins, of the Western Canada Airways, who was recently awarded a trophy as the pilot who had done the most for aviation in Canada in 1928, made the trip from Waterways, at the end of the rails in northern Alberta, to Fort Good Hope and return, on behalf of the Winnipeg Fur Trading Company, calling at the various trading posts along the way. On the trip north he carried 950 pounds of mail and a passenger. The flight was made under difficult conditions, the thermometer dropping to 64° below zero at times. The value of this method of transportation may be appreciated from the fact that furs from the Mackenzie River district would not ordinarily reach Winnipeg for 3 or 4 months."

Mails which previously took weeks to reach the lonely posts in the Mackenzie basin district are now delivered promptly within a day or two, while travelers may reach their destination with ease and comfort instead of "mushing" for weeks behind a dog team.

Two Fairchild aircraft of Dominion Explorers, Ltd., in charge of pilots Sutton and Broatch, were lately engaged in exploration work in the subarctic regions surrounding Hudson Bay. Their main base



RESOURCEFUL AIRMEN INVENTED THE "NOSE HANGAR"

These little frame buildings with unboarded fronts, curtained with canvas, make engine work endurable in the most severe weather. The only difficulty is that at times of high wind the planes may act like the camel that thrust its head into the tent.

THAWING OUT AN ICE-COVERED ENGINE REQUIRES INGENUITY

Even after being submerged in the Ashuapmuchuan River and frozen in, Captain Saunders's monoplane was soon put into condition to fly again (see text, page 608).

was at Tavanne Bay (latitude, 62° 04′), on the west coast of Hudson Bay, and the new planes were flown to that place in July from Amityville, Long Island. Many trips were made by both craft to the end of steel, on the Hudson Bay line, via Churchill, to ferry in supplies, prospectors, and camp equipment.

On September 3 Captain Sutton, with two prospectors, left Tavanne Bay for Baker Lake, a cross-country flight of approximately 200 miles, over country totally unexplored. Owing to the erratic behavior of the compass in these latitudes, the course was steered by the sun. Many flights were made from the base, on Baker Lake, to the other lakes in the territory, as far north as the divide, to Wager Bay.

Captain Sutton met very high winds and heavy seas, which made operating difficult. There is little shelter at Baker Lake. On one occasion his pontoons were punctured and he had to beach his plane. Doing this with no facilities and with the water temperature 34° was no small task.

Equinoctial gales raged between September 18 and 24. Sutton was stormbound at Ranken Inlet with a party of prospectors. The gale reached 80 miles an hour, with an average of between 40 and 50 miles. Much trouble was met in keeping the craft fast to its moorings. The party was living in tents on an exposed shore, which did not make for comfort.

TINY PLANES PROVE THEIR WORTH

After the gales, abnormally high tides flowed, some 15 feet higher than the average, on Chesterfield Inlet. Captain Broatch's monoplane broke from her moorings and was beached 15 feet above the normal shoreline. Fortunately, there is an abundance of kelp in the inlet, and a runway was made by improvising a kelp mattress between the stranded aircraft and water, down which the aircraft was taxied under its own power. The party had an exciting time, as the tide reached the camp. Thirty drums of gas, canoes, and various other pieces of equipment were all afloat and had to be rescued from the ice-cold water before they drifted out to sea.

For short trips, with small loads, in the country about Chesterfield Inlet, a light plane had been brought in by a schooner. This proved once more the value of the ubiquitous British light airplane, such as the De Havilland Moth and the Avro Avian, which have flown even to Australia and South Africa. They are now much employed as auxiliary transports in this new air game and are the standard machines in northern Ontario, Manitoba, Saskatchewan, and Alberta for fire patrols and light transportation. They fold and are easy to handle, on skis, floats, or wheels. They are cheap to operate, while they carry a fair load and use little gas. For short-range work in the vicinity of a base, nothing has been made with wings which can take their place.

"NOSE HANGARS" ARE PECULIAR TO CANADA

Sutton and Broatch were ready to leave for the south when, in October, word came by wireless that the ice had made on the lakes south of Churchill. This was unusual, as the lakes farther north were still open. An immediate return was impossible, and on the 15th of October the machines were drawn up on the beach and the pontoons replaced by skis. That evening there was a good fall of snow, and the aircraft were moved up to a flat plateau behind the camp. "Nose hangars" were constructed, so that the engines might be overhauled in comfort.

This distinctive form of hangar is peculiar to Canada. It is a small tent or frame building, about 12 or 15 feet square, of which three sides and the roof are boarded up and the front closed with a canvas curtain. The nose of the aircraft is drawn into the shelter and the front curtains are made fast around the bow of the fuselage. A stove can be placed in the building and work undertaken on the engine with a fair degree of comfort and efficiency. These nose hangars, usually constructed on skids so that they may be moved from place to place, have become a feature of all temporary flying bases in the north.

On November 22 both Fairchilds were flown south to the end of steel, on the Hudson Bay line, and then, via The Pas, to Winnipeg for their winter overhaul.

Captain Sutton reports ice conditions on that date on Hudson Bay, as seen from 7,000 feet above the western shore, as follows:

"All bays and small inlets frozen; along

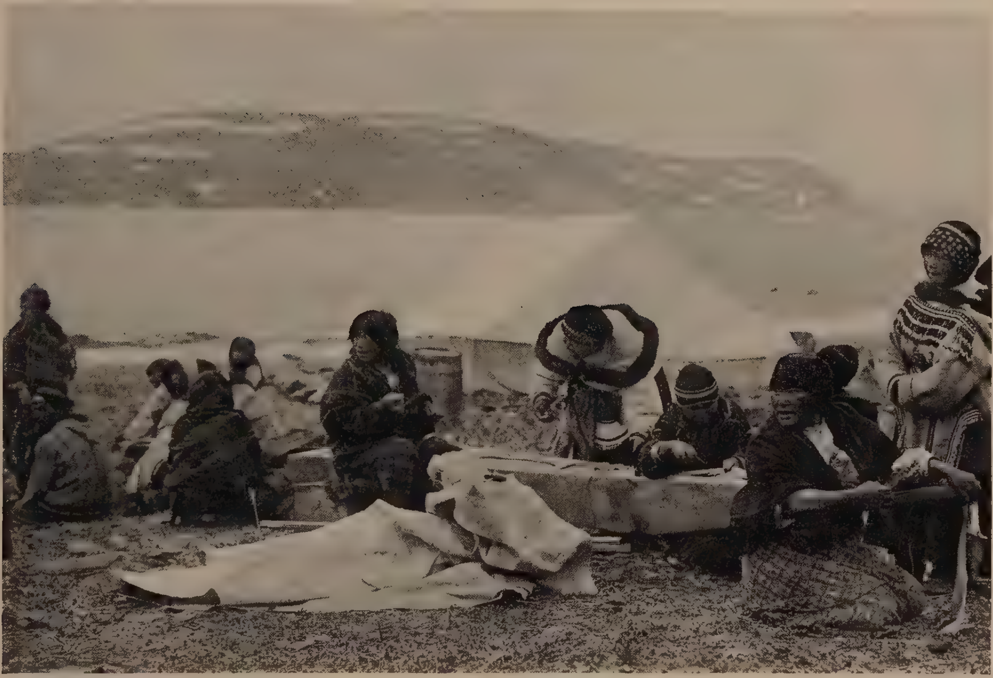
BEYOND BROCHET LIE THE BARREN LANDS

This port on the Saskatchewan and Manitoba boundary is near the limit of timber. From the air the desolate nature of the wild and rugged country is apparent; yet flyers in this region have met with astonishingly few serious accidents.

the straight coast from Tavanne Bay to Cape Eskimo, frozen out for approximately half a mile; from Cape Eskimo to Driftwood Point, frozen for approximately 50 yards; from Driftwood Point to beginning of Button Bay, no shore ice; from Button Bay to Churchill, frozen half mile out. The harbor at Churchill was almost completely frozen over, with the exception of the fast water at the entrance. Large ice floes and pans could be seen offshore as far as the eye could reach."

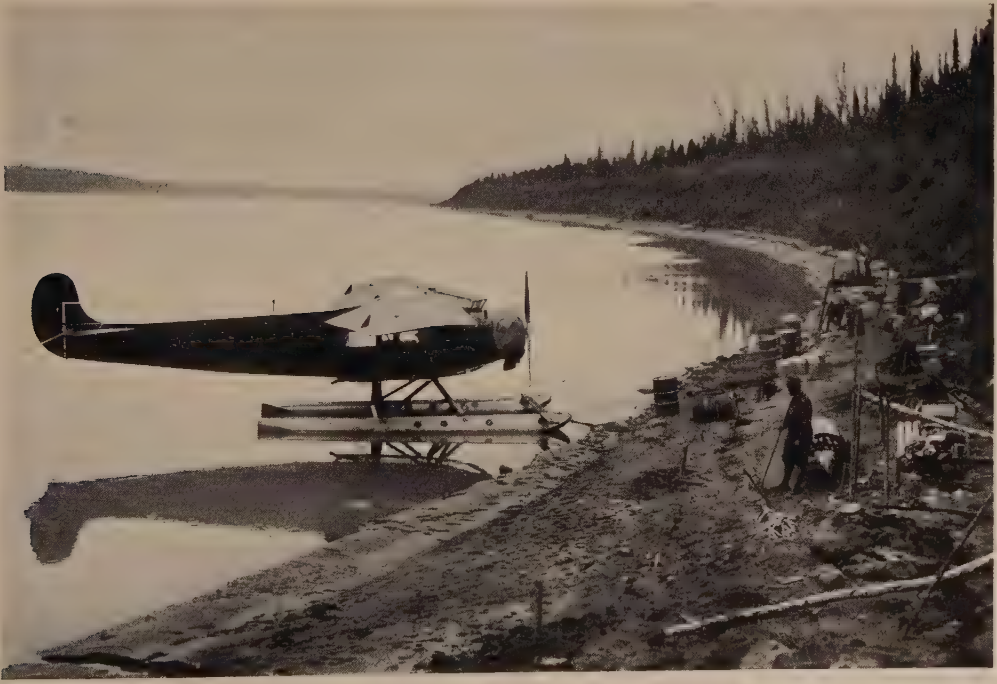
Here air navigation is difficult. The compass varies greatly, owing to the nearness of the North Magnetic Pole, and the landmarks, except on the coastline, are few. The country is a maze of small lakes and its surface is very often bare rock. There is no adequate map of the district. Several lakes more than 100 miles long were seen from the air which are not yet shown on any map. The rivers also have little relation to their courses or positions as shown on the map.

In this region, too, much difficulty was met in landing prospectors and finding safe anchorages for the planes. This is specially true on the coast. The shore is littered with large bowlders, exposed at low tide, but hard to locate when the tide is up. Very high winds were encountered



ESKIMO WOMEN ENJOY BOAT-COVERING "BEES"

The Hudson Strait Expedition reached settlements seldom seen by white men. Somewhat like a New England "quilting" is this party of native seamstresses putting the waterproof sheath on a kayak.



LIARD BASE LIES IN BIG-GAME COUNTRY

Moose, caribou, and grizzly bears abound in these virgin forests, and the streams teem with trout and grayling. From this point a flight of 200 miles was made over primeval wilderness, where there was no trace of human habitation (see, also, text, page 612).

WINTER LINGERS LATE IN CHURCHILL HARBOR

It was mid-June in 1928 when the ice went out at Fort Prince of Wales. Times of thaw are the most treacherous for aircraft landings.

almost all summer; these, accompanied by heavy seas on the bay and inland lakes, required most careful navigation and increased the difficulties of taking off and landing with heavy loads.

One further example of fine air pilotage may be given, out of the many interesting stories told by northern pilots. Captain Burge, a North Sea flying-boat pilot during the World War, operated a passenger-cabin monoplane from May to October, in northern Quebec, Ontario, Manitoba, and Saskatchewan. His mileage was about 20,000. Besides two miners, he carried a tent, three eiderdowns, a 14-foot canoe, built in sections for stowage, with a 1½-horsepower outboard engine, and food.

PROSPECTING INCREASES FIRE HAZARD

Captain Burge vividly describes the loss caused in the north by bush fires occurring far beyond the forest reserves, which are bounded on the north by the Churchill River. On one occasion his party was camped on a lake in northern Manitoba east of Reindeer Lake. Desiring to explore farther north, he left his prospectors and flew single-handed south to Cold Lake, where he had a cache of gas. Taking a full load, about 860 pounds, of spare gas and food, he flew back north some 250 miles and selected a suitable lake on which to make an advance camp. Here he deposited his cargo and left to pick up his partners.

On the way south he ran into thick smoke, which, after about 20 miles, became so bad that all view of the ground was obscured. It was impossible to make a landing, as the surface of the lakes could not be distinguished from the forest surrounding them. Toward dusk he was fortunate enough to find a slight break in the smoke, and landed to find himself within a mile or two of a trader's shack on the east coast of Reindeer Lake.

Burge was nearly out of gas, but the trader had some five-year-old petrol, which sufficed in the emergency. Next morning the smoke lifted a little and Burge left to find his party. He had not been up twenty minutes before smoke forced him down to the tree tops. For hours he flew around, trying to find camp, sometimes absolutely

WINTER FURNISHES BUILDING MATERIAL

This Eskimo woman of Wakeham Bay has to crawl to enter her home. However, though dark and smoky, the igloo is warm.

blind and at other times over raging fires, before he finally located the camp.

This territory was devoid of all habitation. The fires had driven all the game out of the country, and therefore the Indians had departed. The presence of so many prospecting parties has notably increased the fire hazard in the north and all through Ontario, northern Manitoba, Saskatchewan, and Alberta; hence work for the forest air patrols has grown much heavier.

Burge and his party were largely self-sustaining. The lakes are full of fish, though there was little game, owing to bush fires. A steady supply of fresh fish lightened their loads considerably, but Burge does not recommend the diet. "We almost grew fins by the end of the season," was his remark.

It will be seen that the prospector in the north to-day is supplied with all conveniences and comforts of modern travel. Indeed, in the opinion of one indignant young pilot, they are spoilt. "You know old man ——," he said, mentioning the name of a well-known prospector. "I have seen him come in bearded like the pard, from a six weeks' trip mushing behind his dog team, as hard as nails and looking like nothing on earth. Now he strolls down to the air station with a fedora hat, a cigar in the corner of his mouth, a silk shirt, brown shoes and spats, and asks me to take him in to his claims near Kississing; and because, when we get there, the lake is too small to land on and we have to put him ashore on a larger one three miles away, he grumbles because he has to take a short walk through the bush!" There is still plenty of call for hard traveling in the north, however.

PHOTOGRAPHY FLIES NORTH

It is not only the prospector and the mining engineer who are flying in the north. Every agency interested in its development has taken to the air. The air surveys of the Department of National Defense in 1928 covered 65,200 square miles with vertical or oblique photographs and employed eight separate fleets of two aircraft each on this work.

The Engineering Staff of the Department of Railways and Canals has two aircraft of its own and took 180 laborers into Churchill from the end of steel, at Split Lake, in the spring of 1928. They were required to build wharves for the accommodation of the steamers due to arrive in August and September with cargoes of material and men for the construction of the port and railway terminals. To take them in on the ground would have meant a walk of 170 miles across a frozen, uninhabited waste. By air, with the planes making two trips a day, they were carried in four at a time, and in three weeks they were all at work without any trouble, delay, or loss of time.

The assistance of the Air Service has also been required in helping to clear up the question of the navigability of Hudson Strait. Three air bases were established during the summer of 1927—on the southern shore, at Port Burwell, near the eastern entrance; Wakeham Bay, halfway through, and Nottingham Island, at the western approach.

CREW HAS TO ABANDON PLANE ON ICE

Two Fokker Universals, fitted for flying on wheels, skis, or floats, were stationed at each base, and flying was carried out, whenever weather permitted, for 15 months. The mother ship carried a Moth seaplane, with wings folded, so that she could be lowered into the water at any time. She was carried for use as a scout and was invaluable in the location of the bases. She was lost, however, while lying at her mooring, in a sudden gale which overwhelmed the tiny seaplane.

The only other loss was that of one of the Fokkers, caught with its crew while returning from a patrol across the strait from Resolution Island, toward its base, at Port Burwell, on February 17, 1928. In the poor visibility the pilot failed to appreciate the strong easterly drift, which carried him past the long, narrow peninsula and chain of islands forming the southern shore of the eastern gateway to the strait. He was forced to land on the floe ice of the North Atlantic and abandon his plane; but happily he and his party made their way safely to the coast, after many days' hard walking over broken Arctic ice.

These patrols were arranged so that the movement and formation of ice in the strait could be observed at all seasons. The expedition was led by T. A. Lawrence, a veteran pilot of the World War, with long experience in northern flying in Canada, and under him were seven officers and twenty-one men. The whole party returned safely to civilization on November 14, 1928, having gathered much valuable information. The tale of their operations on these rocky and barren shores, where the tides are high and the current runs swiftly, is a fascinating one, as was to be expected. Many difficulties and dangers were encountered and much experience was gained which should be of value to the future of organized flying in the Arctic regions.

Volumes could be written on the work of the new generation of these gentlemen adventurers of the northern skies. They are fitting successors in the long chain of descent reaching back to Henry Hudson and other explorers, and in hardihood and resolution they rival their predecessors. In the exploration of the north, the services of Canadian pilots in time of peace are a fitting complement to their remarkable record in the World War.

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THE DANUBE, HIGHWAY OF RACES

From the Black Forest to the Black Sea, Europe's Most Important River Has Borne the Traffic of Centuries

By Melville Chater

Author of "The Shores of Sunrise," "Through the Back Doors of France in a Canadian Canoe," "Michigan, Mistress of the Lakes," etc., etc., in the National Geographic Magazine

"YOU'RE too late," announced the quay master of Turnu-Severin. "The Danube boat has gone."

"And when does the next one leave?"

"Not until the ice flows out of the Danube, next spring," he replied.

We sat down on our suitcases to think it over. With the especial purpose of taking that westbound boat, we had come by rail from the Black Sea and up the Danube Valley to Turnu-Severin. There the maritime Danube, with its sprawling delta, its reedy expanses, its marshy plains, has been left far behind.

There the Orient has been exchanged for the Occident—Moslem minarets for Greek-Orthodox domes, old Turkish gates for old Roman bridges. There a narrower Danube winds between blue, ever-lifting hills, the gateway to western Europe.

And there, unless, like us, you arrive out of season, you may board one of the big river steamers that all summer long ascend or descend through half a dozen countries lying between the Black Forest and the Black Sea.

THROUGH THE IRON GATE

"Missed your boat, eh?" said a bronzed man standing near us. "If you like, you can come as far as Orsova in my launch. You might catch something up there."

We thanked him and climbed aboard. He proved to be a Hungarian tug captain who had spent some youthful years barging on the Hudson, and he still retained glamorous memories concerning Western ways of progress along that river.

Hardly was Turnu-Severin astern when we found ourselves amid a wild swirl of waters, before whose terrific force our progress more and more resembled the freak feat of trying to mount a descending escalator. The launch quivered with propeller revolutions, yet remained almost static amid crested wavelets that flew past us, so our acquaintance said, at a speed of twelve feet per second.

At last we gained the shelter of an artificially walled channel, from which we presently emerged in midriver, beyond reach of that devil's caldron. Men call this two-mile stretch the Iron Gate, and doubtless the Argonautic heroes in their ascent gave it some equally forceful name, perhaps likening it to the battering club of Herakles.

For thousands of years the club battered, or, if you prefer, the gates clanged against craft that sneaked upshore, towed

Photograph by Melville Chater

RUMANIA'S OIL AND WHEAT TRAVEL UP THE DANUBE BY TANKER AND BARGE

The mighty river's navigable length is nearly 1,600 miles and it serves seven nations on its course from the Black Forest to the Black Sea.

by battalions of men. At last, owing to the decisions of the Berlin Congress in 1878, the rapids of the lower Danube were regulated by Hungary at a cost of $9,000,000.

"There's Ada Kaleh," remarked our acquaintance, pointing to an islet off Orsova. "Folks call it the Forgotten Island because the Berlin Congress overlooked it. Now, would you catch an island being overlooked in the Hudson? Why, there'd be an amusement park on it!"

We went ashore for a glimpse of the quaint island colony of Bosnian Moslems, who long ago built their little houses amid the encompassing ramifications of a dismantled Turkish fortress. It was as peaceful a sight as that of wild flowers carpeting an old shell crater.

Situated between political frontiers and with periodic wars hurtling up and down the Danube, these simple islanders have continued since old Turkish times to cultivate their tobacco and attar-producing roses.

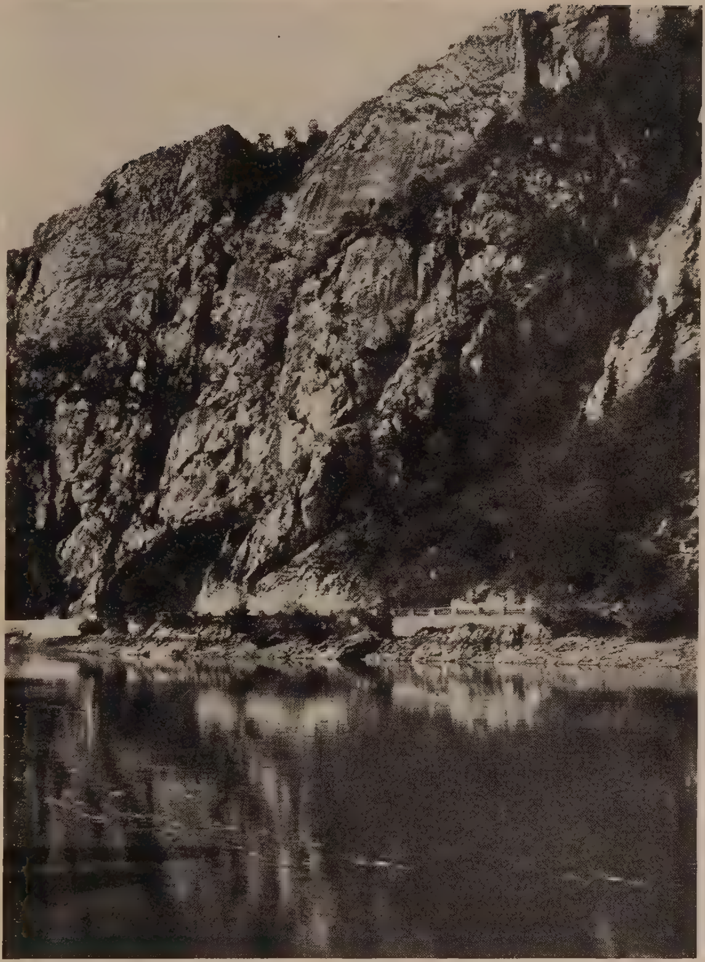
"There's a European war on," they were told during Napoleonic times. And, "Well, it's sure a fine day for it!" replied the old fellows, and went right on with their gardening. That the ensuing Berlin Conference overlooked the existence of Ada Kaleh, and hence apportioned it to no one, probably elicited little local comment beyond *"Inshallah!* As God wills it! But let's get on with our gardening." What though it has since been annexed by one Balkan State and ceded to another? What though the world rings with schemes for suppressing war? Peace or war, little Ada Kaleh keeps right on attar-making, with her serene philosophy of "I cultivate my garden."

A "SCRAMBLED" RIVER

By the time we had landed on Orsova's tree-bordered quay we had talked our good-natured tug captain into taking us with him up the Danube. The business of payment was settled over a glass of Tokay; then we moved our traps aboard, into a cosy deck cabin of the *Patria,* a 400-ton tug, destined for Regensburg, with tank barges of Rumanian oil.

"Only," the captain warned us, "to travel on a tug you must get permission from the river police. You see, the Danube is no free-and-easy Hudson. There's customs duties and enough local port regulations to make a sailorman go bald with worry. No, the Danube's more like a political conflict, with seven tickets in the field, which is to say, it flows through three kingdoms, one regency, two republics, and a social democracy."

He spread out a big chart. It showed the river's entire length to be 1,800 miles—a length that is more than double that of the Rhine and is only exceeded in Europe by that of the Volga. Its navigable portion, as shown on the chart, totaled nearly 1,600 miles; and a glance at its nine political sectors, of which three are joint—that is, shared by pairs of countries—revealed that almost one-third of the Danube's navigable length is thus shared by States which face each other from the river's opposite banks.*



Photograph by Melville Chater

TRAJAN LED ROME'S LEGIONS THROUGH THE KAZAN PASS

Here, shut in by almost perpendicular cliffs, the Danube narrows to less than 200 yards and is very deep. Near the base of the magnificent rock masses, just beyond reach of high water, there are still signs of the military roadway built by the Romans (see text, page 647).

Truly, a "scrambled" river! We appreciated that its police would have no such sinecure as that enjoyed by the proverbial "traffic cop in Venice." Likewise we comprehended why it has been internationalized. That step was inaugurated in 1856, and was furthered in 1921 by statutes guaranteeing freedom of navigation for all flags concerned—a pact which is safeguarded by the International Danube Commission.

The river police proved obliging in our case. With a long tow astern, the *Patria* headed upstream. Presently we entered a sheer-faced gorge of sky-cutting profiles that inclosed us in an endless vista of rock-walled waters.

Silent as twilight, primitive as when the dædal Danube wrought this passage to the sea, the Kazan Defile might easily have seemed to the early Greeks a Charon-haunted Styx leading to the underworld. Their bards called the future Danube the

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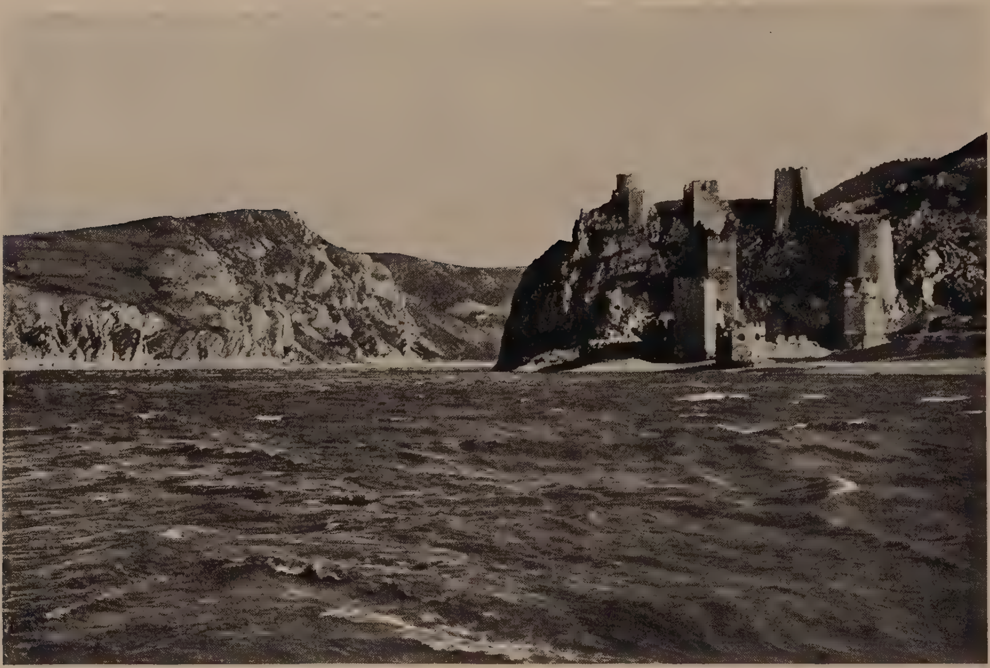
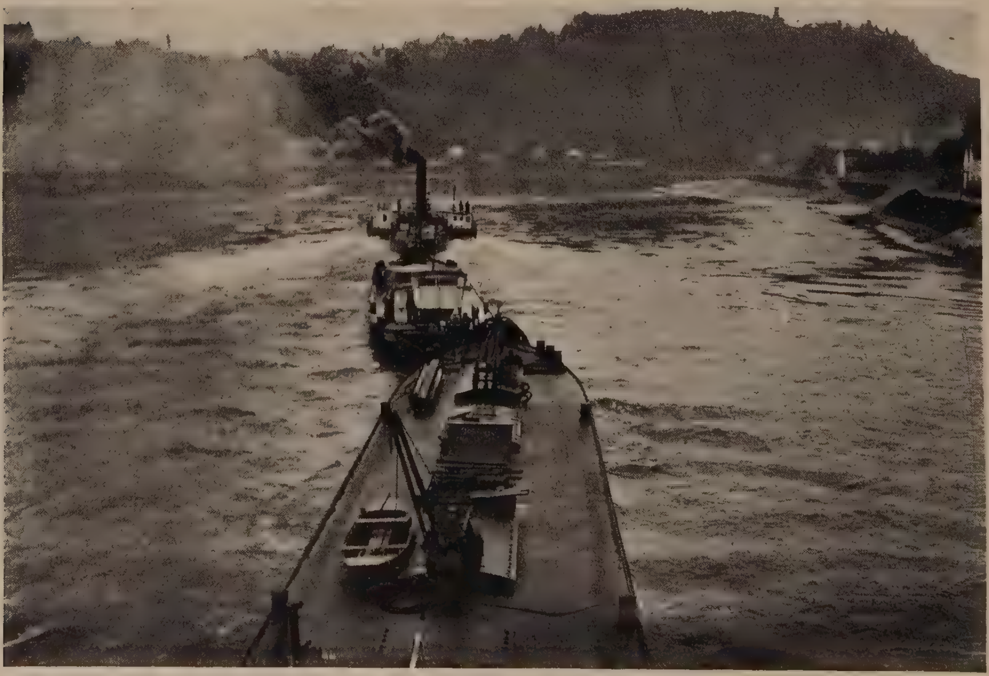
* See the Map of Europe and the Near East, special supplement with this number of the NATIONAL GEOGRAPHIC MAGAZINE.



THE BROKEN MASSES OF GOLUBACZ CASTLE RISE ABOVE A NARROWING DANUBE

At this point in Jugoslavia, a short distance above the Kazan Defile, mountains bear down upon the river from both sides and force it to rush madly between towering walls of rock. The spot is a key to the lower Danube and has been the site of a fortress for many centuries.



Photographs by Melville Chater

A DANUBE TUG TOWS ITS STRING OF FREIGHT-LADEN BARGES

Rising in southern Germany and flowing through six other countries before merging its waters with those of the Black Sea on the Rumanian coast, this mighty river is the most important commercial waterway of central and southeastern Europe.

Photograph by Melville Chater

THE AUTHOR TRAVELED ON THIS TWO-STACKED TUG

Under a provision of the Treaty of Versailles, the Danube was internationalized and boats of all nations may navigate its waters (see text, page 645).

Istros and dwelt in awesome terms on its "shadow-environed origin," thus placing its source at the head of the Kazan, where rapids still swirl malevolently over ledges of rock. Ancient navigation and imagination could no further go.

But the Greeks never permitted superstition to interfere with business. With sword in one hand and merchandise scales in the other, they unloaded textiles, pottery, and arms on the aborigines in exchange for furs, hemp, and slaves.

Later on, Herodotus visited what he termed "the mightiest of rivers." With singular approximation to the facts, he described the Ister as bisecting Europe, and he added a sort of Chamber of Commerce report on honey resources in a Danubian region whose vast bee armies rendered it uninhabitable.

TRAJAN CARRIED ROMAN EAGLES THROUGH THE KAZAN DEFILE

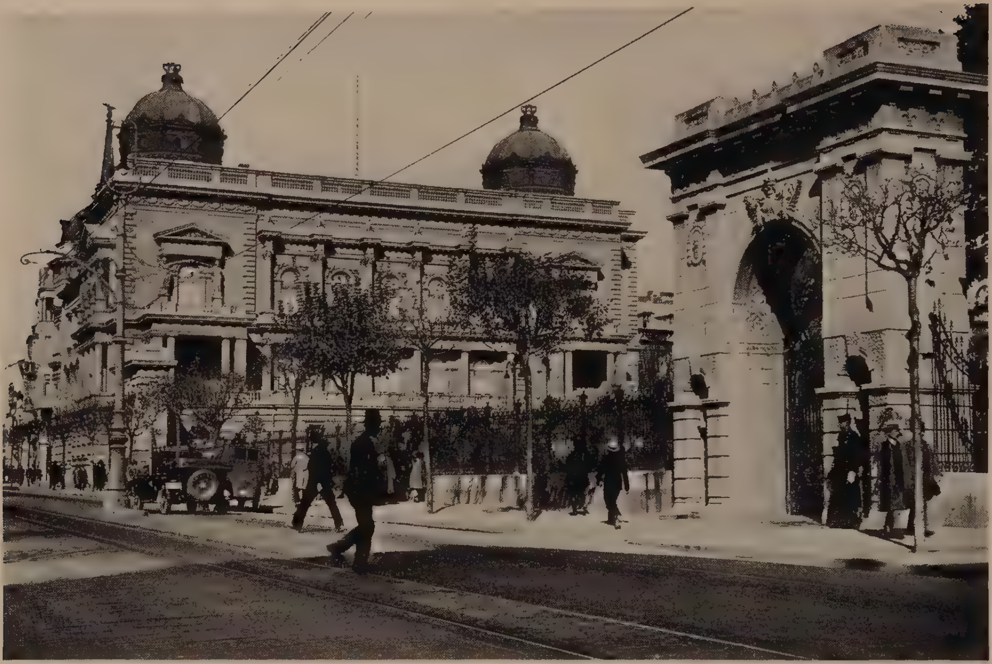
We were fairly steeping ourselves in the romantic qualities of that impassable defile—impassable for anything but boats until very recent times—when, on the side opposite the modern, cliff-skirting road, we beheld a repellent sight. Somebody or other had scratched his name in capital letters on the sheer cliff-face. Now, we had previously encountered scratchings by "Otto Schwartz, Berlin," on the Pyramids, and by "W. Brown, N. Y.," on a spire of Milan Cathedral, but we hadn't anticipated the presence of their tribe in the Kazan Defile.

"What's the ruffian's name?" I muttered. "Looks as if it began with 'Imp—.' "

"I make out 'Max,' " said my friend.

We borrowed the captain's marine glasses. Of that bleared inscription we could discern only "IMP. CAESAR . . . TRAIANUS AVG. GERM. PONT. MAXIMUS." But that was more than enough. And we agreed that Trajan, or any other Roman who could lead an army along the flat face of those river-washed cliffs by means of beam-supported galleries, had a perfect right to cut his name there!

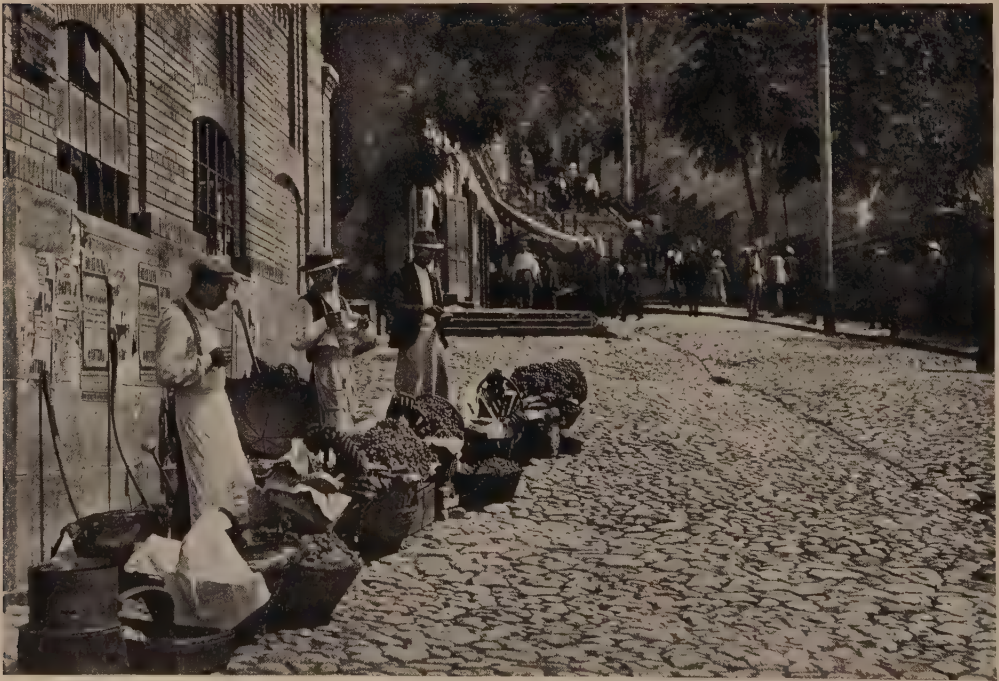
For five centuries the Roman eagles ruled over the entire Danube—a unifying achievement that has not been repeated in two thousand years. "Father Danubius,"



Photograph by Melville Chater

SINCE THE WAR, BELGRADE HAS EXPERIENCED A BUILDING RENAISSANCE

The Royal Palace is only one of many impressive structures built or planned for the beautification of the Jugoslav capital. An ambitious scheme is also under way for the development of an extensive park system, and no effort is being spared to rejuvenate this historic Balkan city.



Photograph by Maynard Owen Williams

OVERHEAD EXPENSE DOESN'T WORRY THESE FRUIT SELLERS

They display their wares in the street and pray for good weather. The thoroughfares of Belgrade are mostly cobbles or wooden blocks, but asphalt and stone paving is one of the first changes contemplated under the new and comprehensive city improvement plan.

a bearded river god, appeared on Roman coins. The river was divided into strategic sectors, each with its separate fleet. Of some eighty far-flung fortifications, little remains to-day except, near Regensburg, traces of the Germanic Limes, a Danube-paralleling wall raised by Rome against northern invaders.

"Trade follows the flag." Castra Regina (Regensburg), Castra Batava (Passau), and other Roman camps developed into traffic centers for grain and military stores. The Danube's second period of commerce had begun.

For two days and nights the *Patria* churned ahead between wide plains, and on the third afternoon we sighted Belgrade (Beograd). Perched high over the confluence of the Danube and the Sava, the Jugoslav capital presents a striking picture. Few European cities are situated on two such waterways, whose navigable lengths within Jugoslavia total 720 miles.

Photograph by Ewing Galloway

MISS SERBIA GOES FOR A RIDE

Instead of pushing her offspring along in a perambulator, the Serbian mother not infrequently carries the little one in a comfortable basket strapped to her back.

BELGRADE BECOMES AN OCCIDENTAL CAPITAL

One's first glimpse of Belgrade's quays, with their gaily bedizened soft-drink sellers and sweetmeat peddlers, misleads one to expect a city reflecting the colorful East. On the other hand, nothing could be more definitely, if nascently, modern than Belgrade's central plexus, where tall buildings loom over wide thoroughfares that lead through shopping, or banking, or hotel quarters.

It is only some occasional glimpse of gaily dressed peasants, or of gun-toting Montenegrins — booted, pillbox-capped, ablaze with crimson and gold—that reminds you that you are still in southeastern Europe, where costumes have not yet been entirely discarded for mere clothes.

One doesn't grasp how recent is Belgrade's occidentalization until, skirting the river-dominating Kalemegdan Park, he gains the ancient fortress at its tip; for the Turks quitted that fortress only 60-odd years ago. Serbia has been free of oriental leading strings for only half a century. And the sight of the confluence of those twin rivers, where occurred some of the

Photograph by Melville Chater

ONIONS ARE AMONG THE STRONGEST ISSUES ON THE CURB MARKET AT BELGRADE

The pungent bulbs are widely used in Jugoslavia in the preparation of *lomac,* a Balkan version of Irish stew. Most of the vegetable marketing is conducted on the street (see, also, p. 648).

most critical actions on the Serbian front during the World War, serves to remind one that it was only with the Armistice that Belgrade became the capital of a Southern Slav State which, culturally speaking, faces westward.

UNDER FIVE FLAGS ON THE DANUBE

We left Belgrade with our burden enlarged to 16 enormously long barges. They flew four different flags, while the *Patria* flew a fifth—an instance of how international a Danube tow may be. For a while vineyard-clad hills enlivened the scene, but beyond the Drava's mouth lay 150 miles of treeless, monotonous landscape, the fringes of the great Hungarian plain.

"It's rather tame here," I volunteered to the skipper. He was hopping to and fro on the bridge like a pea on a hot griddle. "Tame?" he ejaculated. "Well, what with considerably less than seven feet of water hereabouts and a lot of shifting shoals in the channel, I don't exactly have to play patience in order to keep awake. Take a look at my chart."

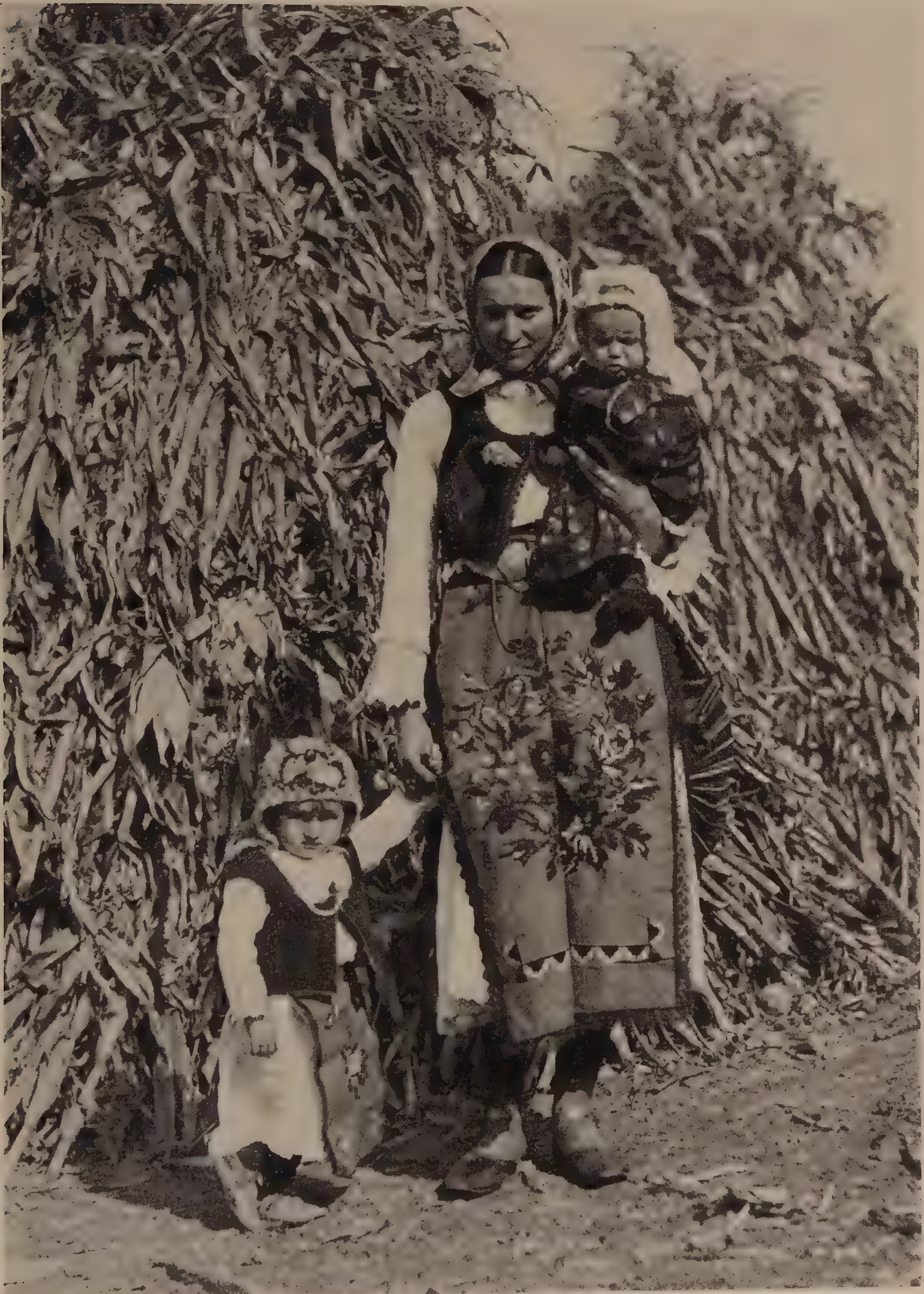
The chart revealed the local section of the Danube as flowing among a plexus of secondary branches that, as delineated, resembled a basketful of snakes. And then we understood why the river's surface was cut by longitudinal and lateral dikes and why levees lifted along its flat banks.

The Danube's depth is proverbially variable. What with its 16 main tributaries and hosts of lesser ones, "high water" at given points on the river may vary by 30 feet, while at "low water" even its maritime section is not navigable for boats drawing more than six feet.

Budapest peered up around a curve. We went ashore without a word of Hungarian at our command, and the first thing we encountered was a shop with an arresting sign. It ran:

POLGARILAKASBERENDEZES-VALLATAT

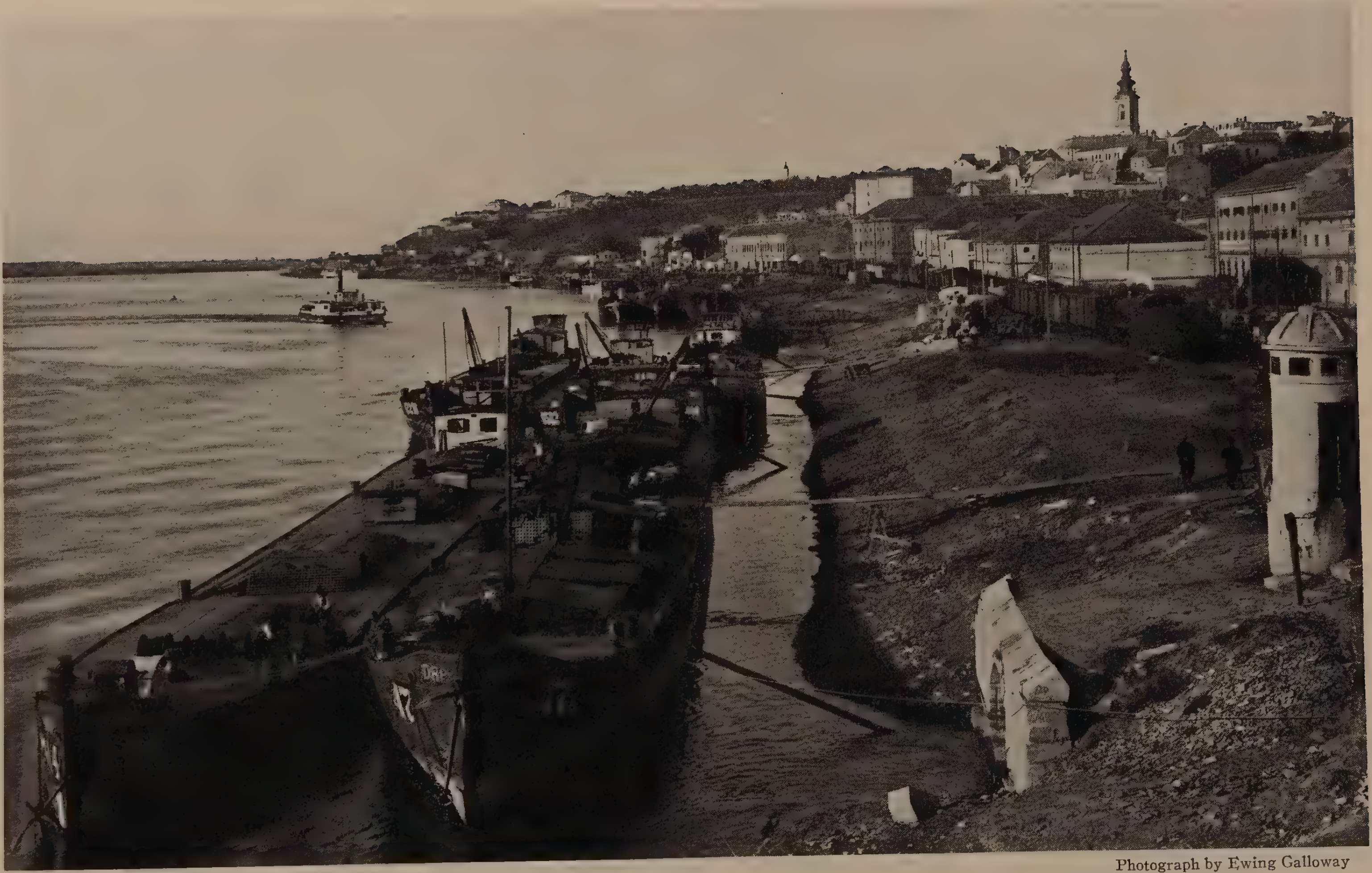
We stood in hushed awe before that sign. It was hypnotic; it had the allure



Photograph by Ewing Galloway

FEMININE LOVE OF ADORNMENT EXTENDS TO WORKERS IN THE FIELDS

As hers is primarily an agricultural country, the Serbian woman, who occupies a place of honor and respect in the social structure, works alongside her husband and brothers in the fields. In common with nearly all her Balkan sisters, she is an adept at the art of embroidery.



Photograph by Ewing Galloway

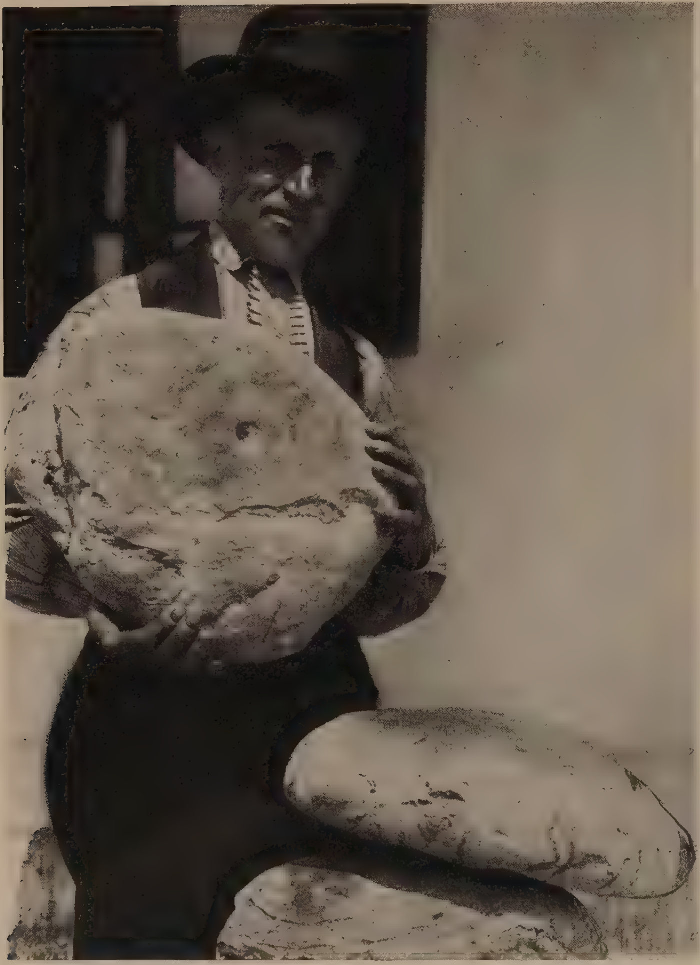
CHEAP RIVER TRANSPORTATION PLAYS A LARGE PART IN THE BUSINESS LIFE OF THE JUGOSLAV CAPITAL

Belgrade lies at the confluence of the Danube and the Sava and about midway between Constantinople and Paris. It is an enterprising industrial city and a shipping center of importance. The cargoes of these boats are grain and other bulk freight.

Photograph by Ewing Galloway

COWBOYS AT A WELL ON THE PLAINS OF HUNGARY

The land of the Magyars is particularly adapted to stock raising and the Government is doing all in its power to improve the quality of the animals, particularly milch cows.



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HUNGARIAN PEASANTS ARE GREAT BREAD EATERS

These Gargantuan loaves weigh more than 10 pounds apiece, and a grown man will sometimes consume three of them in a week.

of a skillful window-dressing. Of an English-speaking clerk, who stood in the doorway, we inquired what the word meant. Glancing down its superb vista of letters, he thus translated:

"For-those-people-of-the-middle-class-flat-furnishing-establishment."

"In other words," we queried, "furniture store?"

"Why, yes," he replied, "if you want to put it that way." He explained that Hungarian is an agglutinative language that permits you to combine half a dozen words in one, and we reflected how economic it would be if you could get past with that sort of thing on an American telegraph blank.

Certainly, whatever difficulty Hungarian presents to the outsider, it is offset by those agreeable and cosmopolitan Budapesters, who seem able to address every foreigner in his own tongue.

BUDAPEST, ONE OF EUROPE'S LOVELIEST CITIES

Not to know Budapest is to have missed one of the loveliest of European cities. It has its own distinctive stateliness that reflects the cultural flowering of a race whose kingdom has been enthroned on the Danube for a thousand years. As certain American metropolitan quarters, such as "Little Italy" or "Little Germany," reflect their mother countries in miniature, so Budapest's topography reflects on a small scale the lineaments of what, as a result of the war, is literally "Little Hungary." Ancient Buda, on the Danube's right bank, rears aloft on rocky crests that represent the foothills of Hungary's mountains, while on the other bank modern Pest stretches away in levels that prelude Hungary's plains.

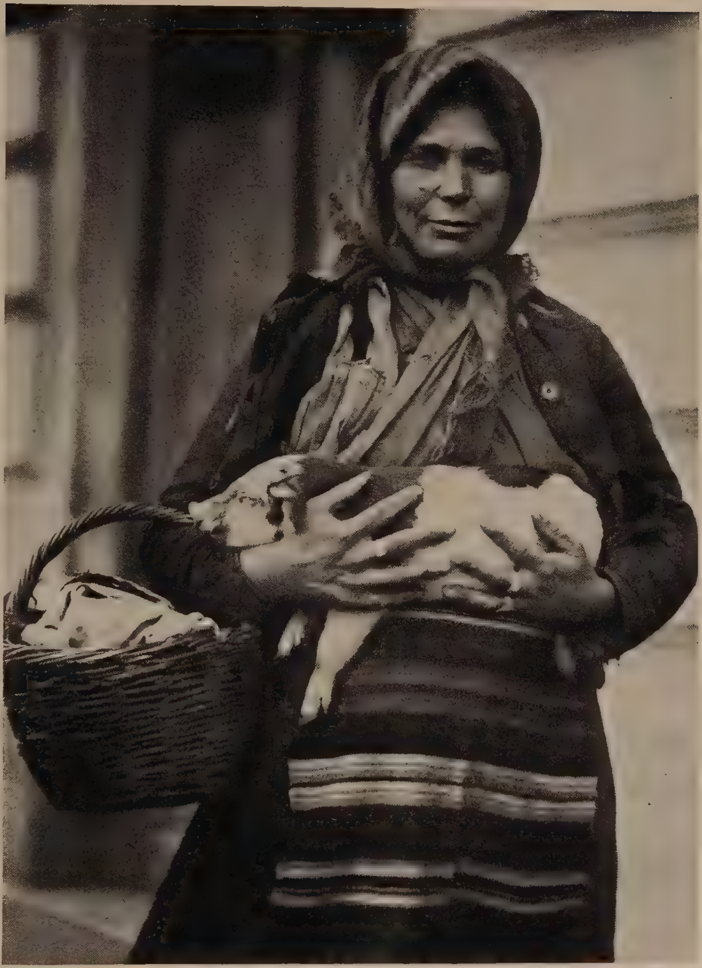
Buda, with its splendid palace, symbolizes Hungary's long succession of rulers. reaching from Stephen the Saint, of 1000 A. D., down to the latter-day reigns of Maria Theresa and Franz Josef. Pest's parliament houses, memorable in their river-set majesty, symbolize the early won liberties of a people whose forefathers' rights were established almost contemporaneously with England's winning of Magna Charta.

Above all, Budapest is a city of beautiful vistas. One's admiration is divided between its stately public buildings and the carefully apportioned squares, parks, and boulevards that lend to the picture an architectural airiness, a spaciousness undefaced by an industrialism whose chimneys loom in adjacent suburbs.

Few cities over the million mark, with as many as 72,000 factory workers, can boast, like Budapest, of an unindustrialized aspect, of an island pleasance lying in midriver at its doors, of delightful riverside promenades, where one lounges or lunches and where motor cars are strictly tabu. And in all this one senses an old civilization which, in the face of postwar changes, still clings to the graces of life.

Certain of those changes reveal with what ingenuity Hungary has met her reconstruction problem. "How many crowns for a dollar?" we asked a Budapest foreign-exchange clerk; and he replied, "I'll give you the rate in pengös." Pengös? We were familiar with most European currencies and we had a literary acquaintance with doubloons, ducats, and moidores; but what, in the name of coins ancient and modern, was a pengö?

The answer, as suggested by the word's tinkling sound, is "Money that rings like gold." When postwar Hungary's currency crashed, the phrase "Hungarian krone" (crown) became a synonym of worthlessness, and so, along with her financial reconstruction under the auspices of the League of Nations, a national coin-naming competition was inaugurated. As a result, the discredited "krone" was replaced by the onomatopœic "pengö," to reinforce faith in the stabilized currency.



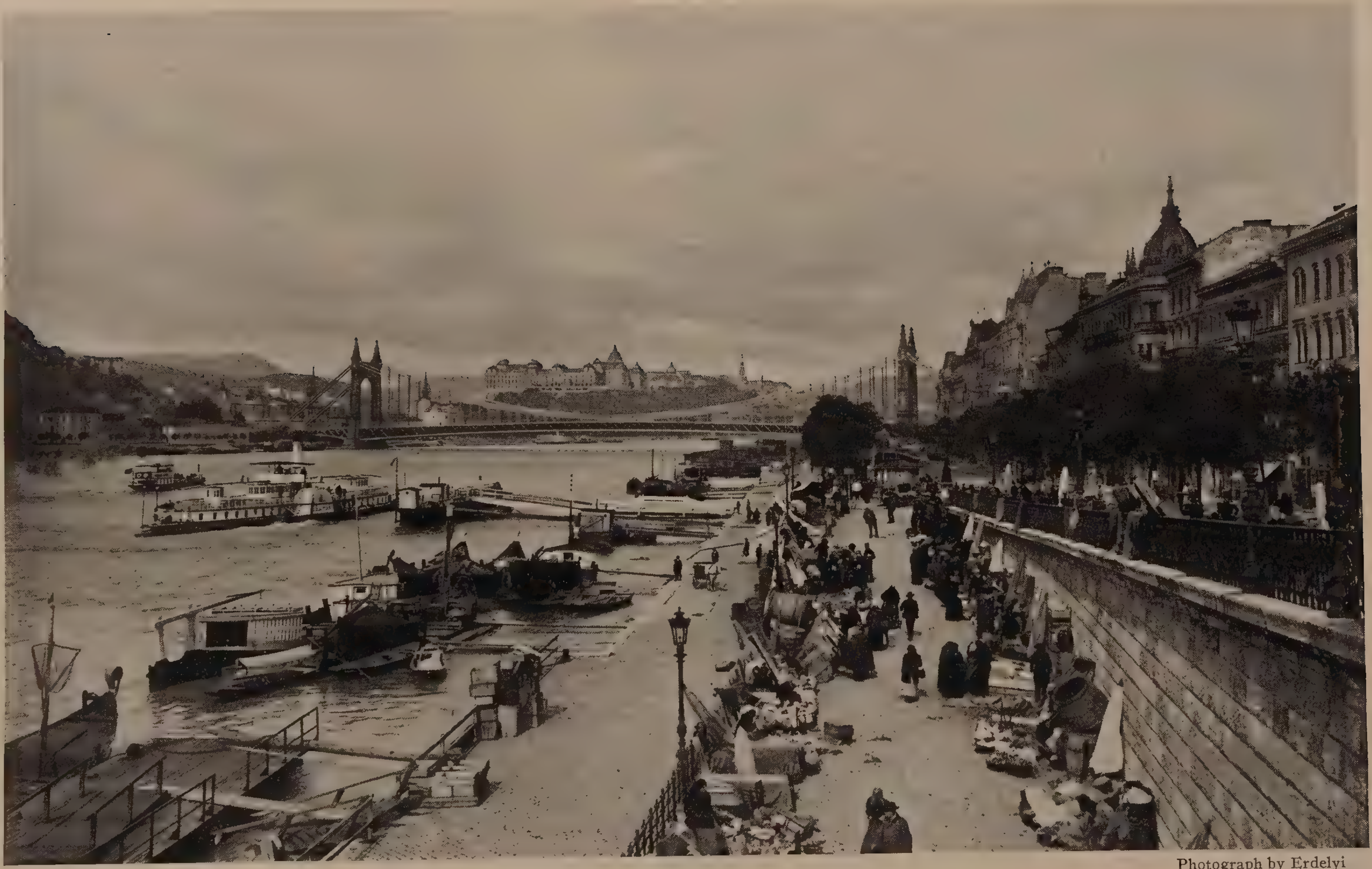
Photograph from Willard Price

A SUCKLING PIG TAKES THE PLACE OF CHRISTMAS TURKEY IN THE BALKANS

The Serbian oak forests provide excellent pasture for pigs, and the peasants raise them in large numbers at small cost. Hundreds of thousands of pigs are exported annually by Jugoslavia.

THE EYE IS ASSAILED WITH COLOR ON THE HUNGARIAN PLAIN

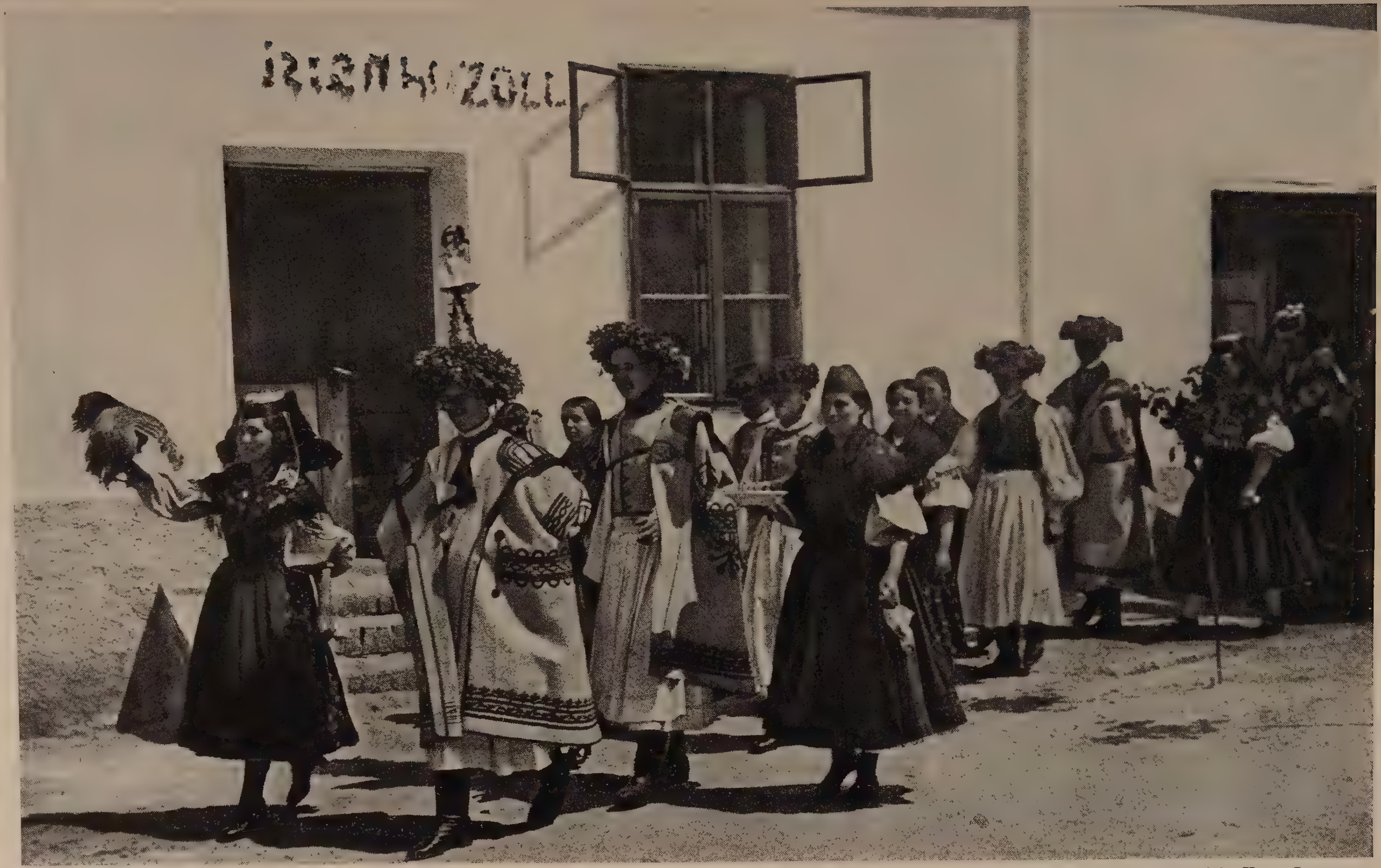
Shortly after our arrival at Budapest we discovered that, contrary to our first impressions, the Hungarian plain is far from being either monotonous or lacking



Photograph by Erdelyi

SIX GREAT BRIDGES SPAN THE DANUBE BETWEEN THE HILLS OF BUDA AND THE PLAINS OF PEST

The handsome Elizabeth Bridge (in the middle distance) has a suspension span of nearly 1,000 feet. The impressive pile of the Royal Palace rises from the heights of Buda in the distance, across the river (see, also, illustration, page 658). In the foreground is a Pest riverside street market.



Photograph by Kerny Istvan

THERE ARE NEARLY AS MANY WAYS OF CELEBRATING A WEDDING IN HUNGARY AS THERE ARE VILLAGES IN WHICH TO WED

The peasants are a hard-working people and they make much of such opportunities for gaiety as come into their lives. The wedding festivities last from two to three days among the poorer classes and a week or more among the rich. Indeed, legend tells of one celebration which lasted a full year. These revelers are from southern Hungary (see, also, text, page 658).

Photograph by Melville Chater

MARIA THERESA'S MAGNIFICENT RESIDENCE AT BUDAPEST

For a thousand feet the façade of the palace extends along an eminence overlooking the Danube. A beautiful terraced garden descends steeply to the river.

in color. You needn't travel for more than a few hours east of the capital in order to see all the colors of the rainbow, or gypsy camps, or a Wild West round-up, or a first-rate Fata Morgana, with illusive seas and cities rising across the plain.

The colors assailed our eyes at the village of Mezökövesd one Sunday morning, in a church square seething with folk. Their black garments merely served as background for superimposed stripes, aprons, bodices, woven in mixed patterns of orange, green, yellow, and purple.

A fringed apron, kaleidoscopic in effect, hung from the waist of each maiden or youth. The former's full-pleated skirt swayed rhythmically as she walked. The latter, in his short, velvet-collared jacket, his tall, flat-brimmed derby, and that indescribably coquettish apron, would have inspired any Fraternal Order of the So-and-sos with hints for a striking lodge costume.

Matrons wearing the cornucopia-shaped coif of medieval association displayed garments of lesser color areas, while dear old grannies promenaded in solemn black—mere background for youth's peacock pageant.

People began to assemble inside the church. Down the village street came a costumed wedding party. In naïve symbolism of hoped-for fertility, the bride bore a chicken, while the bridegroom displayed a baby doll in his hat; and after the event was over the peacock maidens paraded up and down in pairs for the especial benefit of the peacock youths, while we drably clothed onlookers discussed the connection between colorful clothes and early marriage.

The Wild West round-up may be witnessed around Debreczen, whose neighboring plains contain 60,000 head of live stock.* The spectacle of stalwart *csikós* (cowboys) throwing the lasso while wearing derby hats and petticoats lends itself to mirth until one discovers that for dex-

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* See, also, "Hungary, a Land of Shepherd Kings," by C. Townley-Fullam, in the NATIONAL GEOGRAPHIC MAGAZINE for October, 1914.

Photograph by Melville Chater

LIKE A FAIRY PALACE, HUNGARY'S PARLIAMENT HOUSES RISE BESIDE THE RIVER

Despite the fact that it covers an area of four and one-third acres, this noble late-Gothic structure at Budapest creates an impression of lightness and delicacy. It was completed in 1902 and is numbered among the world's finest legislative palaces.

terity with rope and horse they have few equals (see illustration, page 660). The big round-ups coincide with Debreczen's fairs, where masses of horses, longhorned cattle, and gaily clad csikós form a spectacle that could hardly have been equaled by our West at its wildest.

From the northward-rising Tokaj-Hegyalja Mountains, whence comes the sweet and heady Tokay wine, and to southward, along the Tisza's entire course, stretches the larger Alföld, or Great Hungarian Plain, separated from the smaller Alföld by two mountain ranges. Inundation is its ancient enemy. Government engineers assert that the fall of a single dike on the Tisza would put one-sixth of Hungary under water.

The Alföld's grassy expanses, where sky meets circling horizon like a blue, inverted bowl, has the poetry of timeless calm. At times its distant clouds seem so low, so solid, that you almost fancy a cowboy could lasso one and haul it to earth. Daylong nothing is heard but sheep bells atinkle or the lulling pastoral of some shepherd's flute.

A PROMISED LAND TO THE HUNS

What a promised land must have spread itself before the slant-eyed Huns when, in the 4th century, they appeared on those illimitable pastures! These terrible little men—long-armed and flat-faced, clad and capped in skins—were steppe-dwellers, children of the wind and sand. As mobile as those elements, they and their vast encampments of covered wagons and herds, ever trekking from the grass-submerging sandstorm's approach, became ever more like it—a yellow deluge, swift and unforeseen, sweeping over the grasslands of Europe.

For Rome was failing; the Danube's gates stood wide. Five centuries of barbaric invasions obliterated civilization's works along its course. Its banks were held by Franks, Goths, and Gepidæ; by Thuringians, Alemanni, and Avars — a confrontation of tribes north and south,

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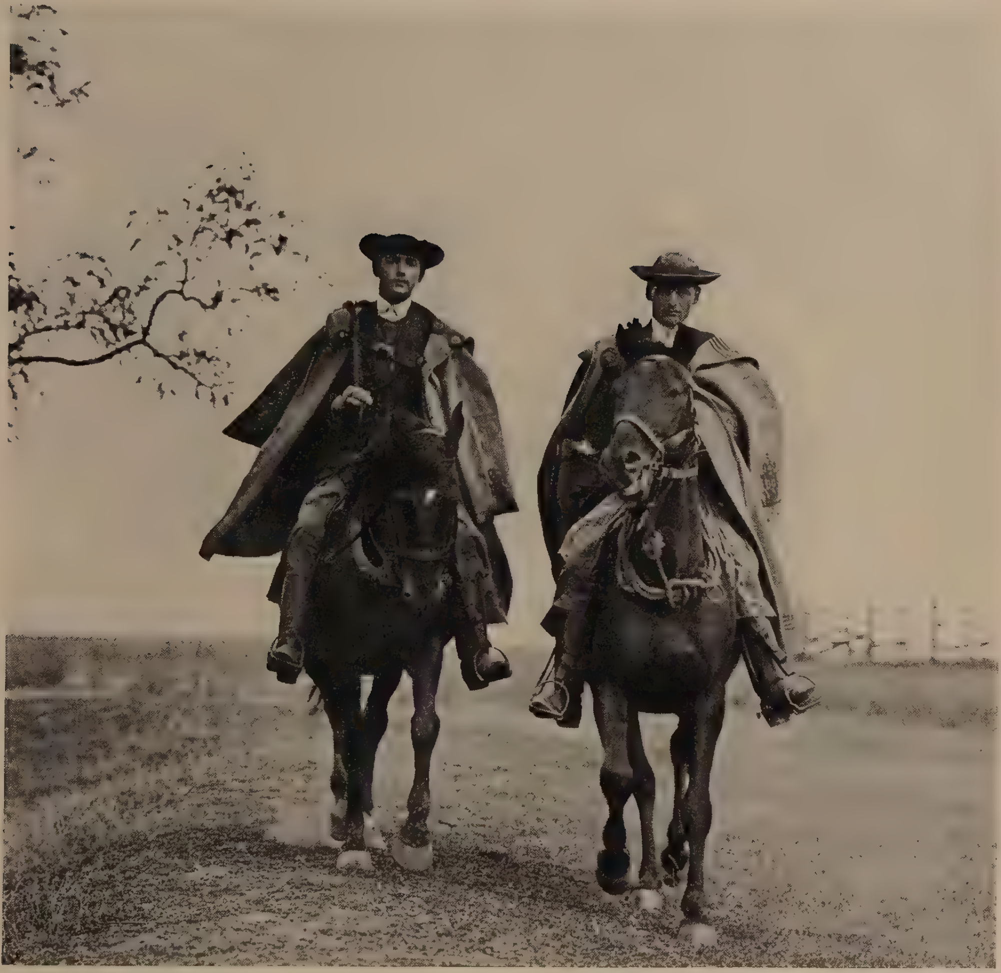
EVEN WILL ROGERS COULD LEARN ABOUT ROPES FROM HIM

His skirtlike trousers and full sleeves in no way interfere with the ability of the Hortobagy cowboy to swing a lasso. He leads a wild and often solitary life on the great plains, but is never really lonely while he has the companionship of a horse. There are few riders anywhere to whom he has to acknowledge superiority.

Photograph by Melville Chater

CABBAGE IS CHEAP AND PLENTIFUL THROUGHOUT CENTRAL EUROPE

These particular heads are to satisfy the appetites of citizens of the Hungarian capital.



Photograph from Melville Chater

SOME OF THE WORLD'S FINEST HORSEMEN ARE COWBOYS OF THE HUNGARIAN PLAIN

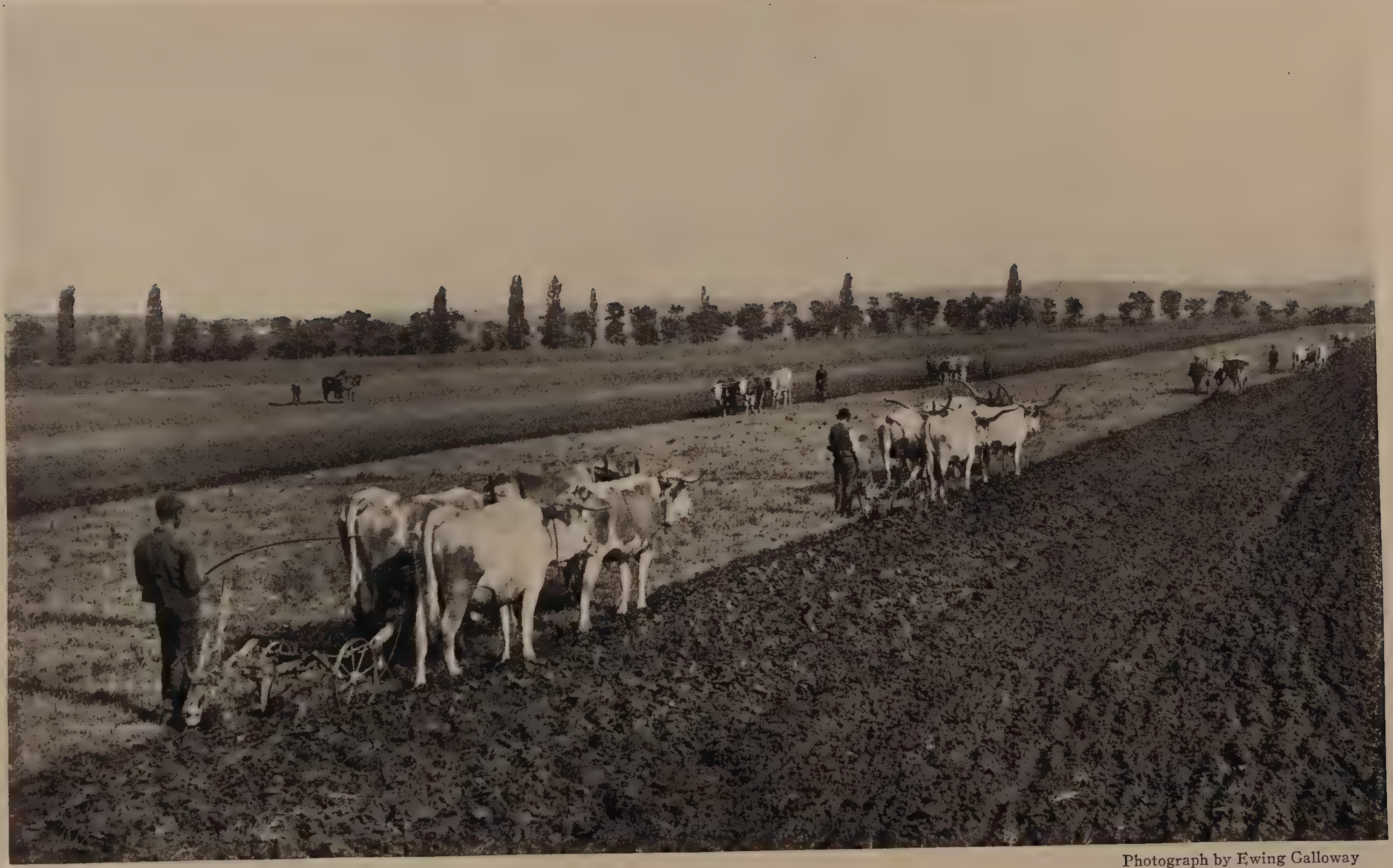
These men are born to the saddle. For centuries their ancestors have been horsemen, and in the days of mercenary troops Hungarian cavalry was always in widespread demand. They wear great white cape-coats richly embroidered in brilliant colors.

living in feud and fattening on public molestation. Not until the later Bulgars gained control between the Tisza and the Black Sea did Danubian commerce emerge from its long eclipse.

A VISIT TO DOLEFUL GYPSIES OF THE HUNGARIAN PLAIN

Our contact with the Alföld's gypsies occurred amid some crazy hovels adjoining the raveled-out ends of a village street. Against a background of dirt floors, paneless windows, filth indescribable, out rushed a gang of wild-eyed children, swarthy men, slipshod women, to see what they could sell us. Now, we were feeling rather depressed at the moment. "What, ho!" we said, rubbing our hands in joyful anticipation. "Wine! Music! Something snappy, something American!"

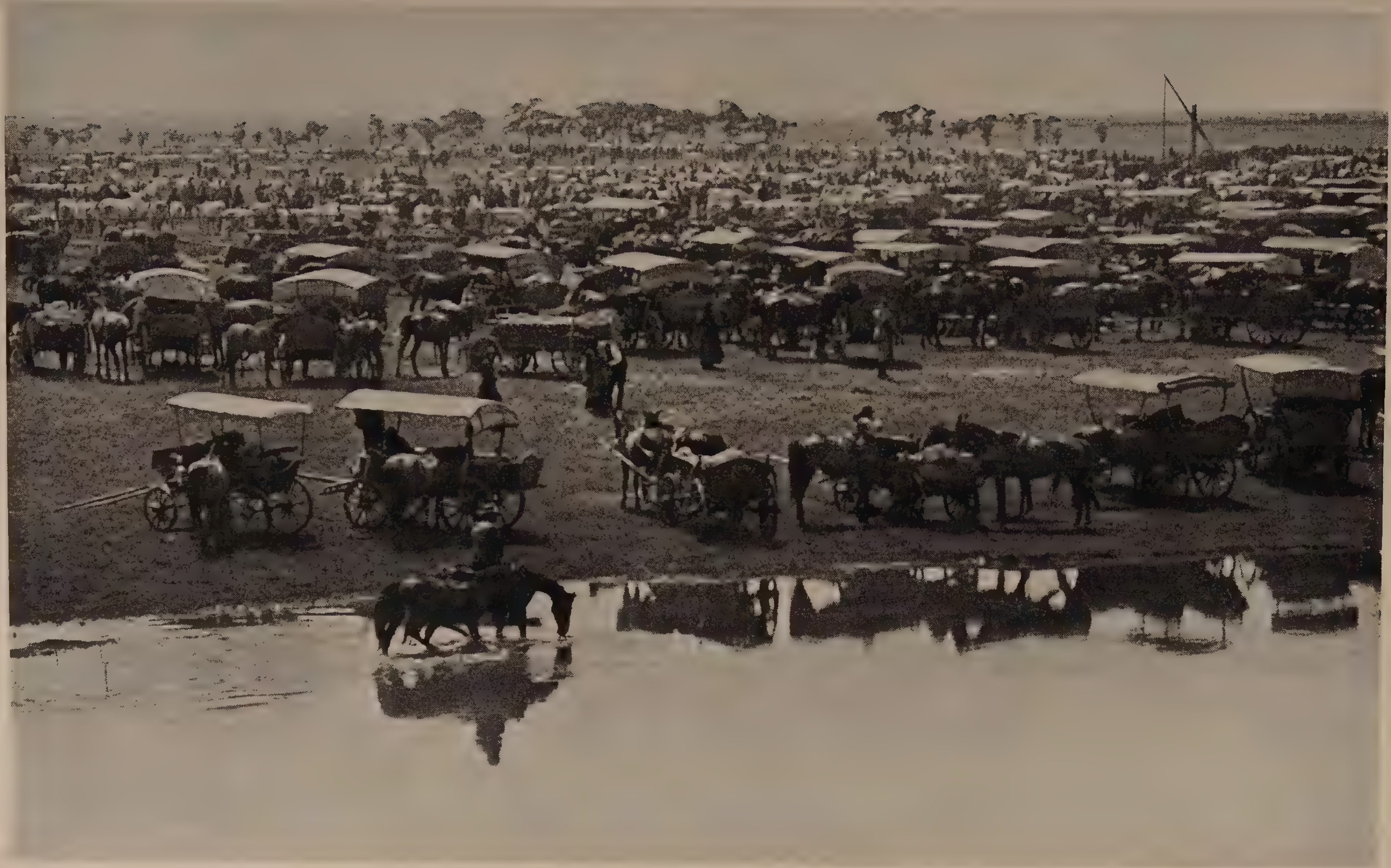
Now, whatever be the tune, your true Tsigane musician seems temperamentally unable to perform it except in wild and wavelike strains of abysmal despair. We relaxed ourselves for jollification, while guitar and mandolin struck up that merry little bygone ballad about "No bananas



Photograph by Ewing Galloway

MODERN PLOWS, DRAWN BY OXEN, BREAK THE LAND FOR WINTER WHEAT ON THE HUNGARIAN PLAIN

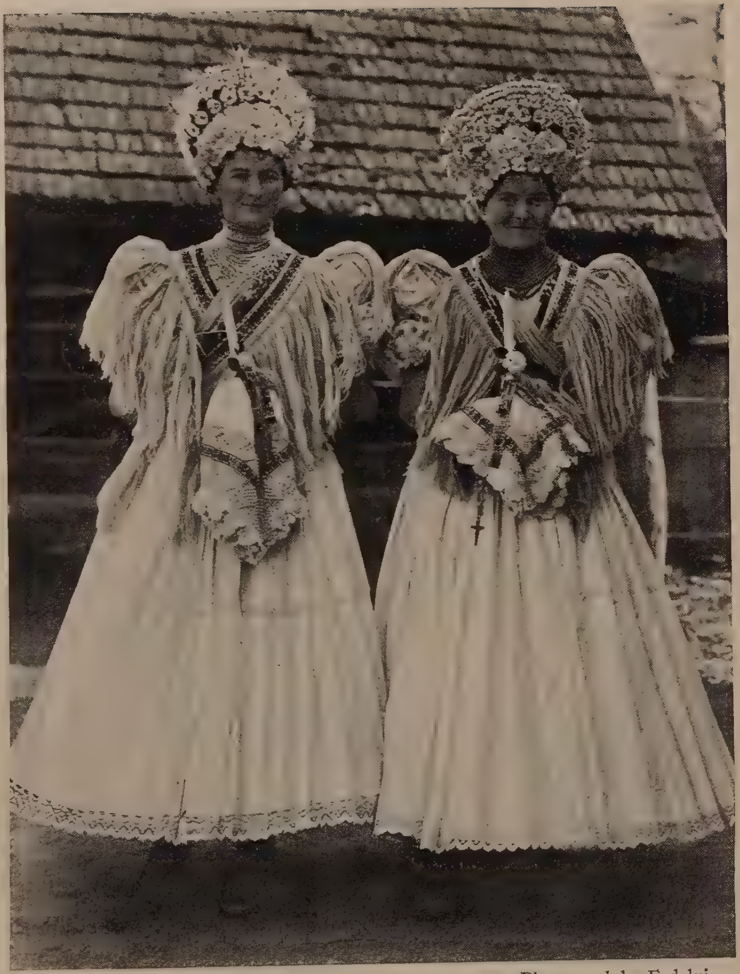
The farmers of this favored agricultural region are prospering now, as the country attempts to adjust itself to the new economic conditions arising out of the World War.



© Kerny Istvan

ONCE A WEEK HUNGARIANS COME TOGETHER FOR A GREAT HORSE MARKET ON THE HORTOBAGY PLAIN NEAR DEBRECZEN

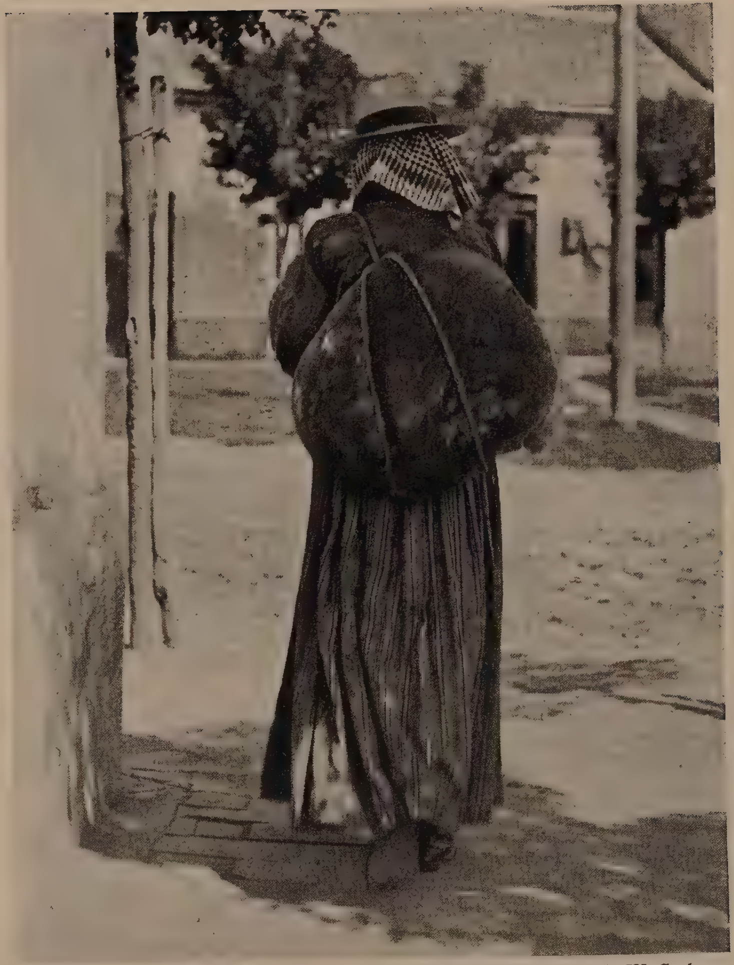
Although the innovations of a motor age are making themselves felt in Hungary as in other parts of the world, horses still hold a place of importance in the economic structure. The Magyars are very successful in breeding them and have developed a splendid strain of animals.



Photograph by Erdelyi

THEIR LACE CAPS IDENTIFY THEM AS BRIDES

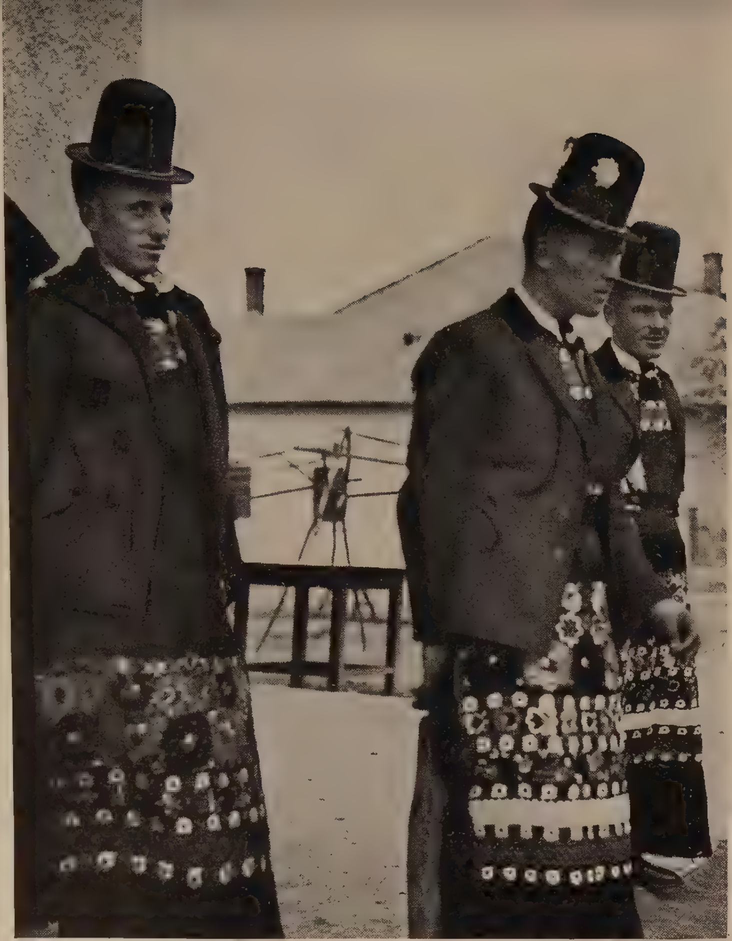
These girls of Mezökövesd, a village of the Hungarian Plain east of Budapest, are members of a religious association for the encouragement of faith and the observance of church duties.



Photograph by A. W. Cutler

HER "DAILY BREAD" IS A SIZABLE LOAF

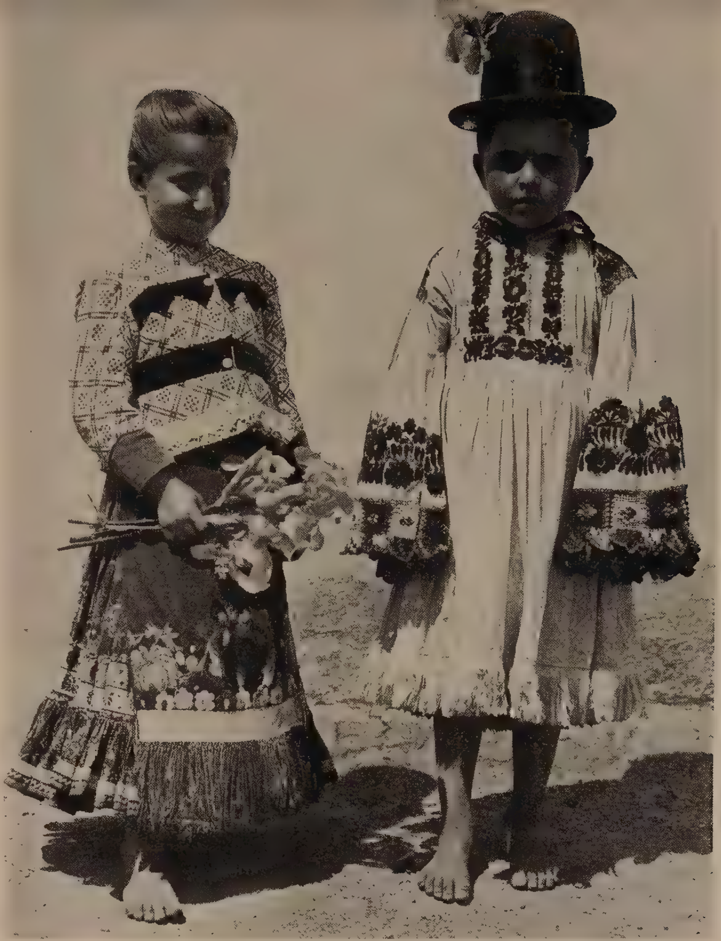
Made of rye flour, this bread keeps fresh for two or three weeks. It has a sour taste much appreciated by the Hungarian peasants (see, also, illustration, page 654).



Photograph by Melville Chater

RURAL BEAU BRUMMELS

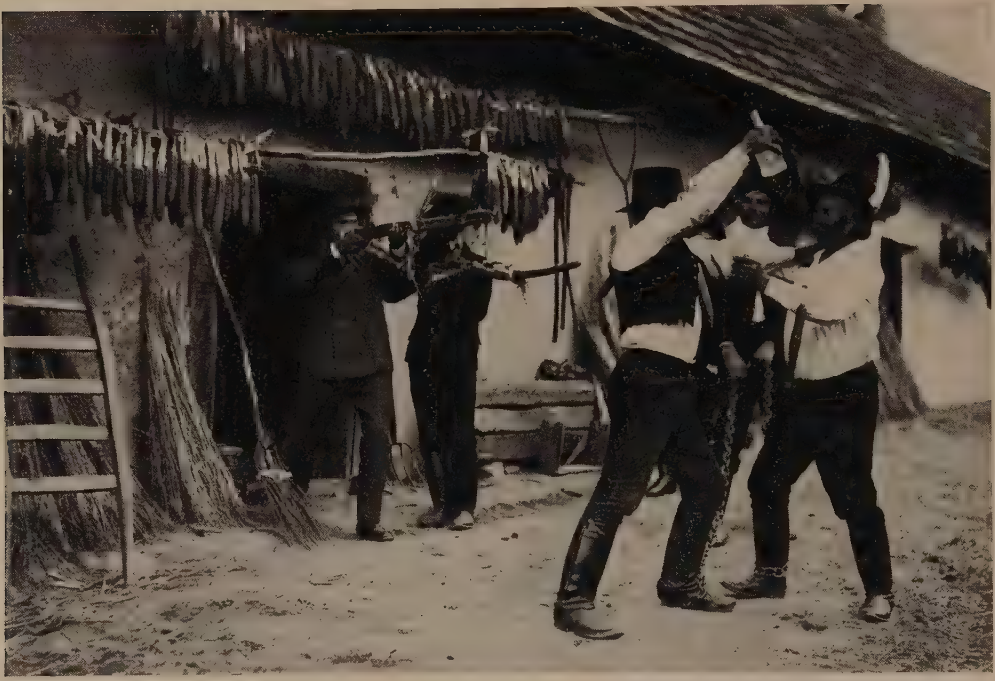
The male delegation in a Sunday afternoon fashion parade in Mezökövesd resembles a group of candidates for a fraternity initiation in America. The fringed aprons are black, decorated in orange, red, green, and purple, while the embroidered shirts are in rainbow colors on a white background.



Photograph by Ewing Galloway

MINIATURES OF THEIR ELDERS

The Sunday costumes of these children of Mezökövesd differ from those of their parents only in size. The Matyo people who live in this village, according to some authorities, may be descended from camp followers left behind by the Mongol hordes which overran Hungary centuries ago (see text, page 659).



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WHERE PROMPTITUDE IS A VIRTUE WELL IMPRESSED

Bacchus Play is an old national custom which persists in connection with marriage in the northern part of Hungary. The best man takes note of those guests who are late for the wedding feast, and on the following day he assembles musicians and "gendarmes," armed with tin plates and "rifles" constructed of vines, and goes in search of the late comers. After being feasted well with wine, their faces are sooted and their feet chained. They are marched around the village until late at night, stumbling over their chains and providing a mirthful spectacle for their neighbors. Finally flour is put on their heads and they are dragged to the well and a pail of water poured over them. At night their wives are allowed to come and free them from their chains.

to-day." But the Tsigane interpretation sounded somewhat as follows:

"Yes—but that was yesterday
When, in some sobby-sobby Eden
Or yearny-yearny Hesperides
That golden fruit was ours.
But to-day—Oh, wretched outcasts, we,
Oh, the inexorably irretrievable!—
We have no bananas to-day!"

It was enough to cause a banana addict to renounce that fruit for the rest of his life.

BREASTING THE RUSHING DANUBE AGAIN

We returned to Budapest and tug life. Bridge after bridge fell astern, as the *Patria* headed for that cliff-fringed section of the Danube where it makes its big turn westward. Our paddle wheels churned no less briskly than those of the river's floating grain mills, set amid a current that rushed past at six feet per second; but we really didn't comprehend its speed until we sighted our first Danube raft. Somewhat resembling a dog kennel on a plank, it raced downstream toward us until we could see that it consisted of a wide expanse of milled timber supporting a living shack and several German raftsmen. One of the men was steering with a huge oar, two more sat back to back on a keg, and all three were the gloomiest-looking mortals imaginable.

"Where from?" yelled our skipper.

"Black Forest!" the steersman yelled back.

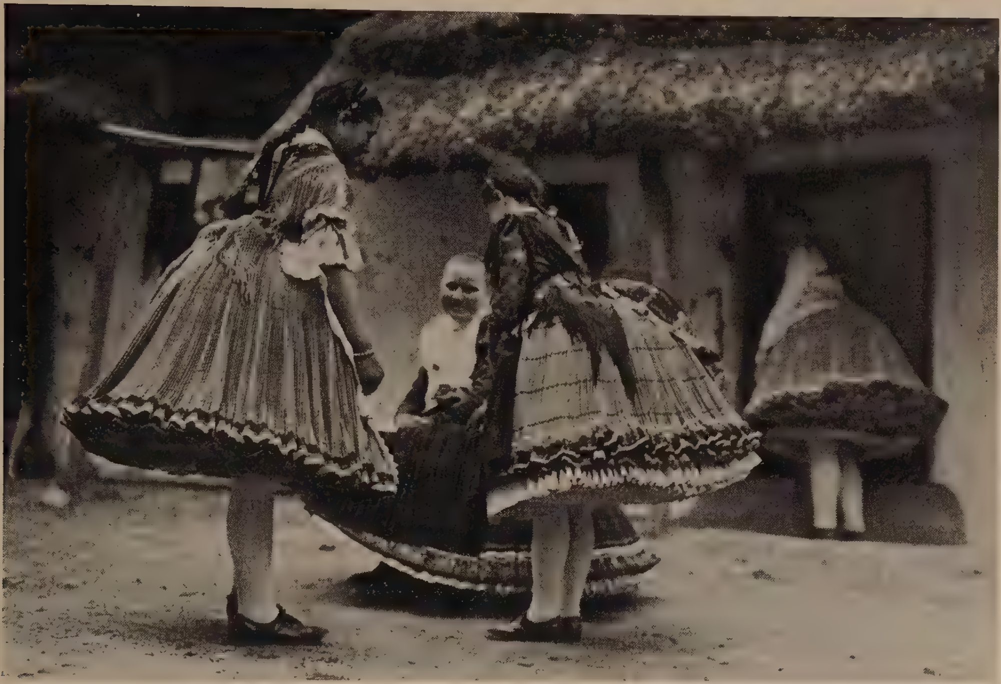
"Plenty food aboard?"

"No; next to nothing."

"No bread or sausages?"

"Yes, plenty; but the beer keg's run dry!"

Ahead rose the Little Carpathians, forming the background of a busy port scene of quays, cranes, canal boats clustered



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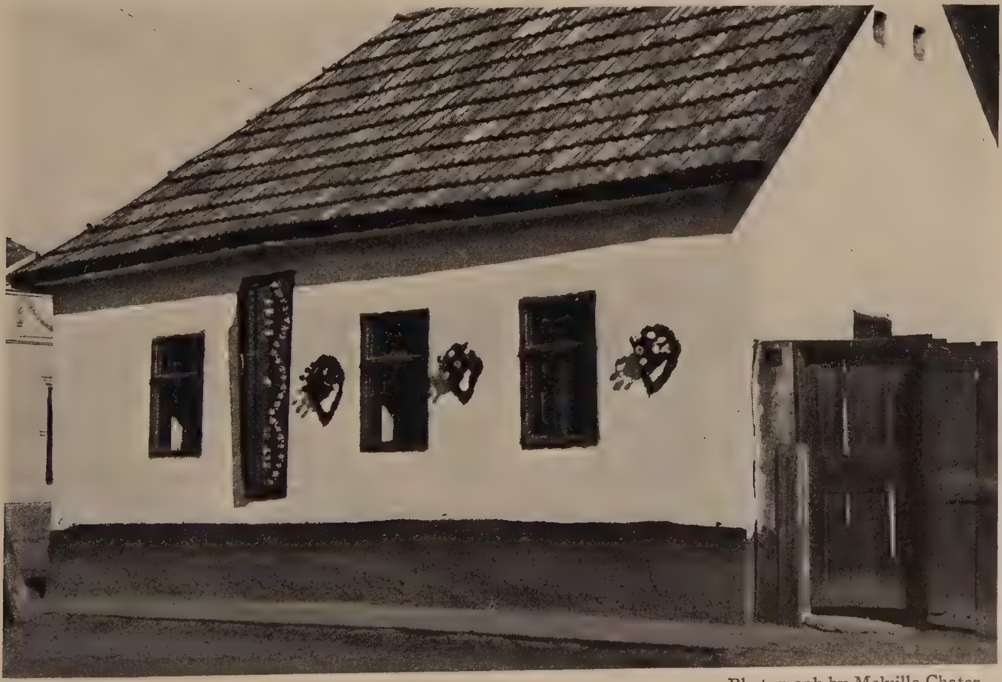
THEIR SKIRTS ARE MANY, WIDE, AND SHORT

In some Hungarian villages as many as ten petticoats are worn, one over another, and some of these contain about ten yards of material drawn into tiny folds at the waist.



Photograph by Melville Chater

DEATH HAS PUT ITS MARK UPON THIS HOME

Among the Matyo people of Mezökövesd (see, also, pages 664-665), the custom is observed of announcing death by attaching an empty coffin to the outside of the deceased's house.

in slips. When the *Patria* had tied up, we went ashore for a stroll in what our German guidebook called Pressburg.

We ascended to the town's castle-topped summit. It commands a splendid panorama of the Danube's two arms encircling the Great Schütt, which local pride proclaims "the largest interior island in Europe."

"How do you like Pozsony?" asked a venerable, patrician-looking gentleman at our side.

"Pressburg, you mean?" we inquired.

"Nonsense!" he snapped. "Am I not a Hungarian? Weren't our kings crowned here for centuries? Pozsony, if you please!"

We descended to the quay, and there we fell into conversation with a young Czechoslovak. He showed us the extent of postwar constructions that give this transshipment port for grain, coal, metals, and textiles a handling capacity of 3,000,000 tons a year (see pages 682, 684).

"A busy town, Pozsony!" we commented.

"Pozsony?" he returned warmly. "This is the Czechoslovakian port of Bratislava!"

We begged his pardon, and we would have been perfectly contented with his correction if, upon our return to the tug, a German bargee hadn't greeted us with "Vell, how you like Pressburg?"

A SIDELIGHT ON 2,000 YEARS OF DANUBE HISTORY

And there you are—one river port variously named by three nationalities, each name bearing for each nationality a peculiar cultural significance! Here is a striking sidelight on that timeless shift of peoples and powers which is so largely the story of the Danube.

Not all the conquests of Trajan, Attila, Charlemagne, Genghis Khan, and Napoleon have altered the Danube's enduring characteristic of ethnographic ununiformity. With the Orient at its mouth and the Occident at its source, the passage of 2,000 years has not modified its striking contrasts in cultural levels. The rise and fall of empires on its banks have but brought the reshuffling of ever-diverse peoples. And some of those reshufflings have been colossal. As a result of the World War, 58,000,000 Austro-Hungarian subjects regrouped themselves in the succession States and elsewhere.

HAINBURG SAW 1,000 "NIBELUNGENLIED" KNIGHTS MARCH TO THEIR DEATH

Beyond Bratislava we skirted Hainburg, a hillside picture of town walls, curious gates, crumbling towers. It is one of half a dozen Danube towns mentioned in the "Nibelungenlied" as being associated with the downstream journey of Burgundy's doomed knights.

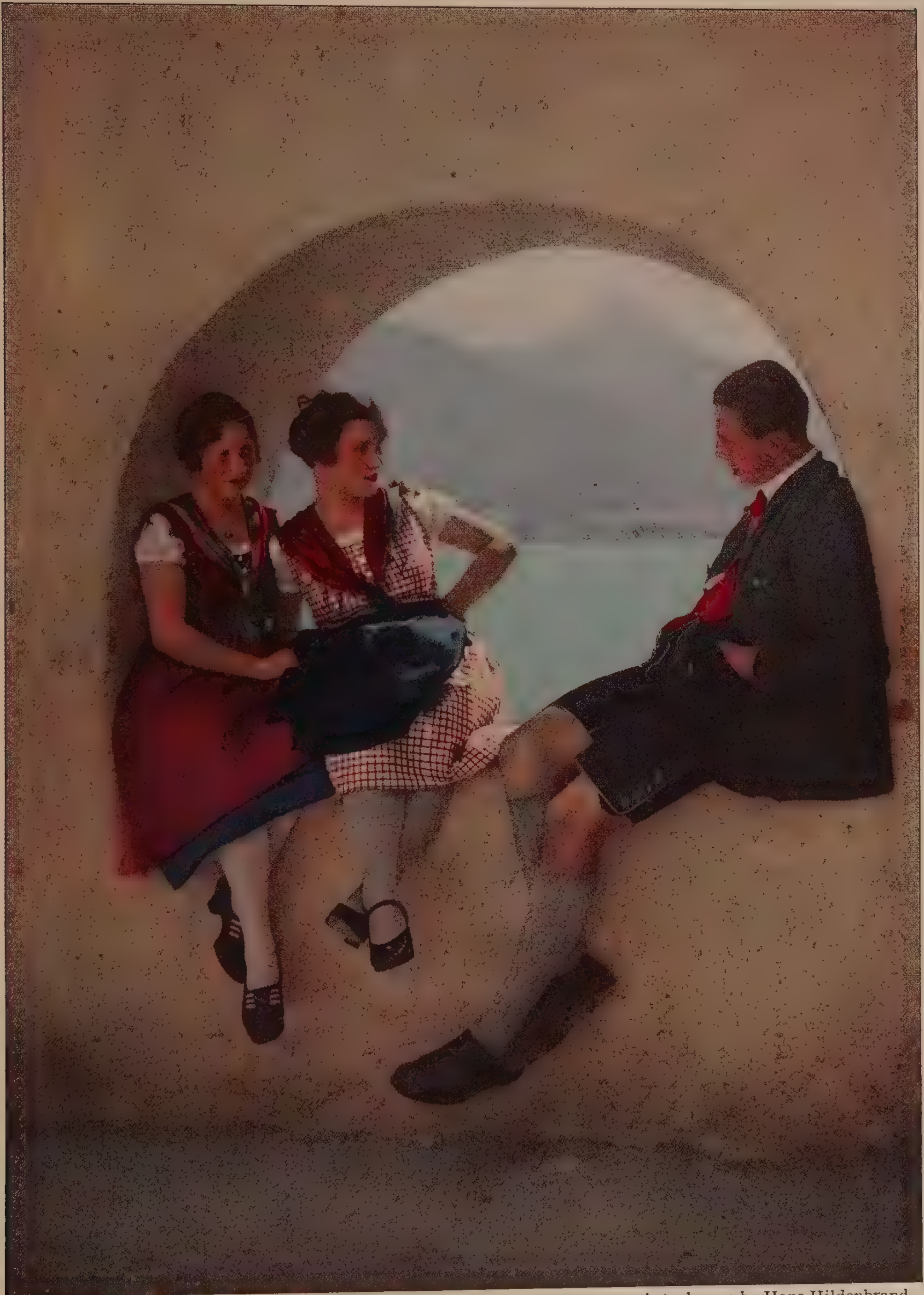
In the Middle Ages the "Nibelungenlied" corresponded to our modern crime story. Not that there was anything in it to unravel, for those were the frank days of murder without mystery, when, instead of invoking abnormal psychology, one referred murders to a blood curse.

When Hagen slew Siegfried in Burgundy, there was no need to page some legendary Sherlock Holmes. Everyone recognized that the murder was due to the Nibelungs' curse. Kriemhild, the deceased's widow, became the queen of King Etzel (Attila), withdrew to his castle on the Danube, and grimly bided her time. Then, when the late unpleasantness had blown over, she dispatched messages to Burgundy, inviting a thousand knights, including the guilty Hagen, to visit her.

Ignoring the prophecies of friendly mermaids, gaily the maildight thousand descend the Danube to Etzel's court. And now Kriemhild stages the festal scene for murder without mystery. Instead of dropping poison into Hagen's beer, she fires the banqueting hall; whereupon the Hungarian knights fall upon the Burgundians until all are extinguished in flame and blood. No unraveling is necessary: the Nibelungs' curse is to blame. Nothing simpler, my dear Watson!

VIENNA'S UNIQUE BLOCK APARTMENTS

Beyond Hainburg the Danube's banks lowered into the wide plain where lies Vienna. The captain, saying that he would like to show us something of postwar Vienna, took us to his apartment. It was situated in a big, modern edifice facing on two avenues and inclosing a courtyard of such dimensions that all of the building's balconied windows, rising in tiers, received daylight and an ample view.



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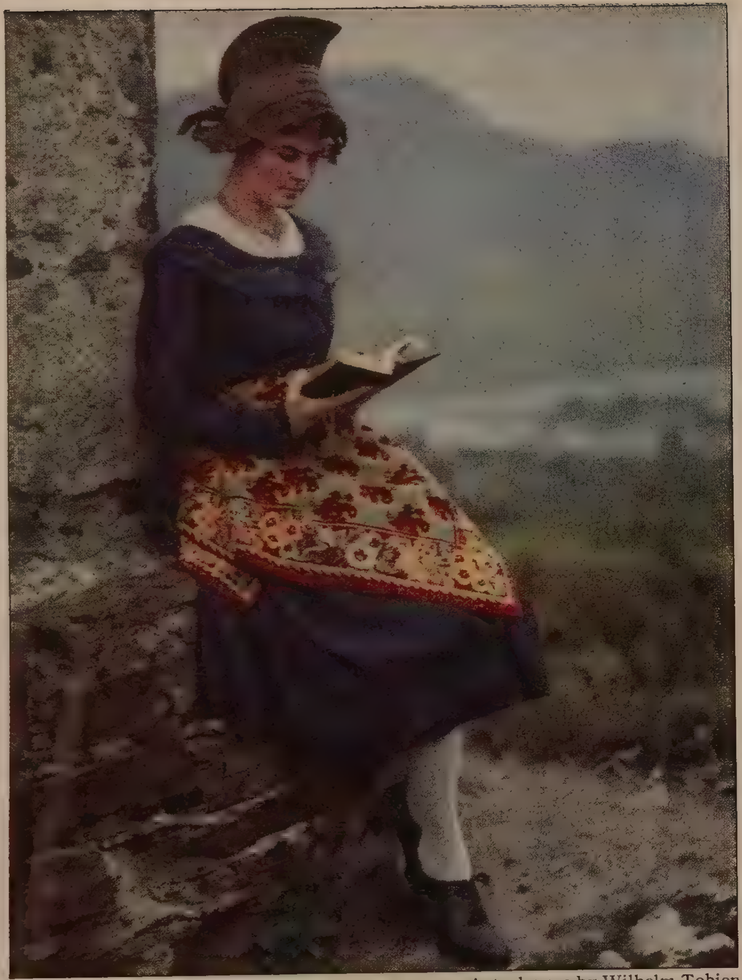
Autochrome by Hans Hildenbrand

ST. WOLFGANG'S ARCHES MAKE DELIGHTFUL WINDOW SEATS

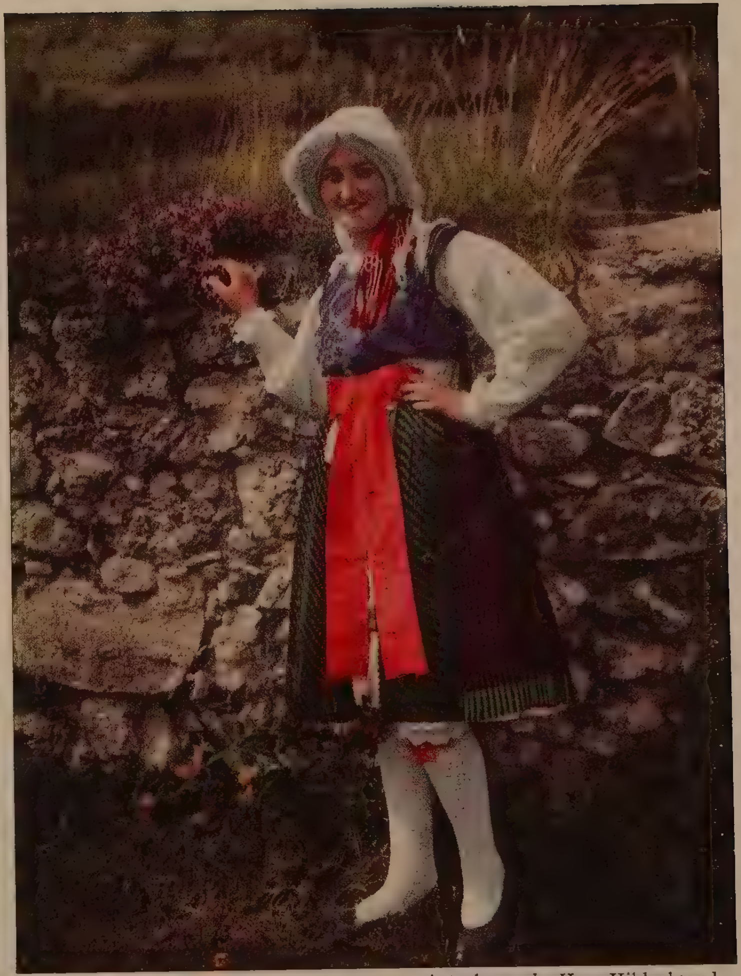
These young folk of the most important market center on the Abersee are perched in an opening in the arcade wall surrounding the court of the town church. Legend says the patron saint flung his hatchet from the distant peak of the Falkenstein to the spot on the lake shore where his shrine now stands.



© National Geographic Society Autochrome by Wilhelm Tobien

ROMANCE LIVES IN THE VERY AIR OF THE WACHAU

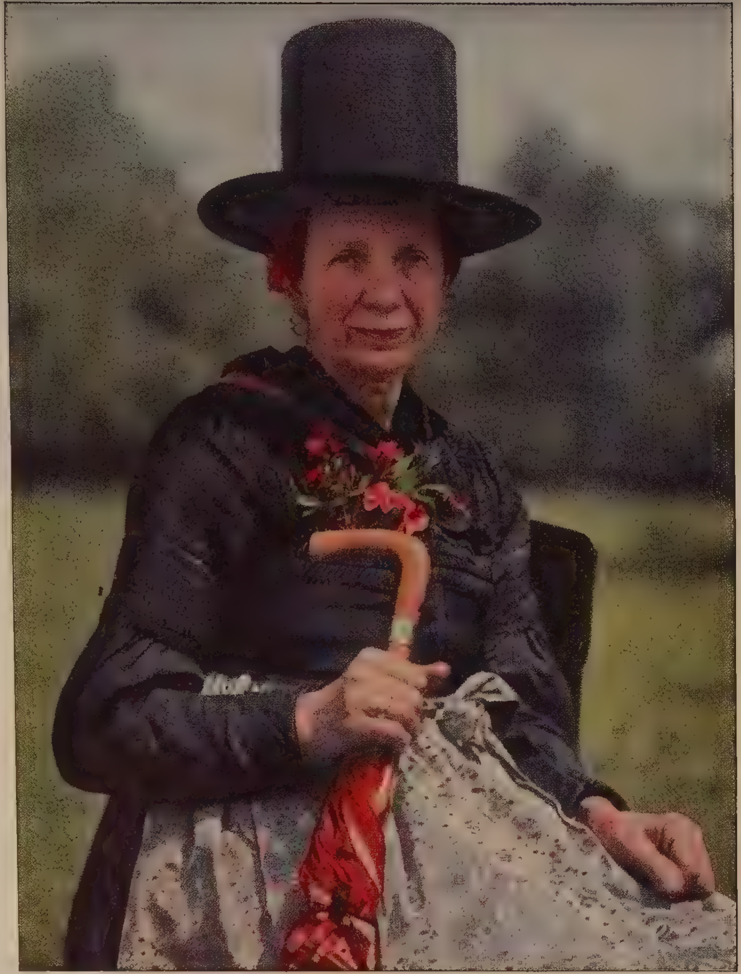
Wearing an old-time folk costume, the girl of Spitz on the Danube has found an ideal place to read a tale of chivalry. In Dürnstein Castle, only a few miles away, Duke Leopold VI held Richard the Lion-heart prisoner in 1192-3.



Autochrome by Hans Hildenbrand

COQUETRY SMILES IN A BEWITCHING FOLK COSTUME

A pretty girl of Nötsch, a tiny village in the Gailtal west of Villach, shows justified pride in her dress, which from gay garters, coyly displayed below the knee, to closely pleated cap, is a triumph of the needleworker's art.



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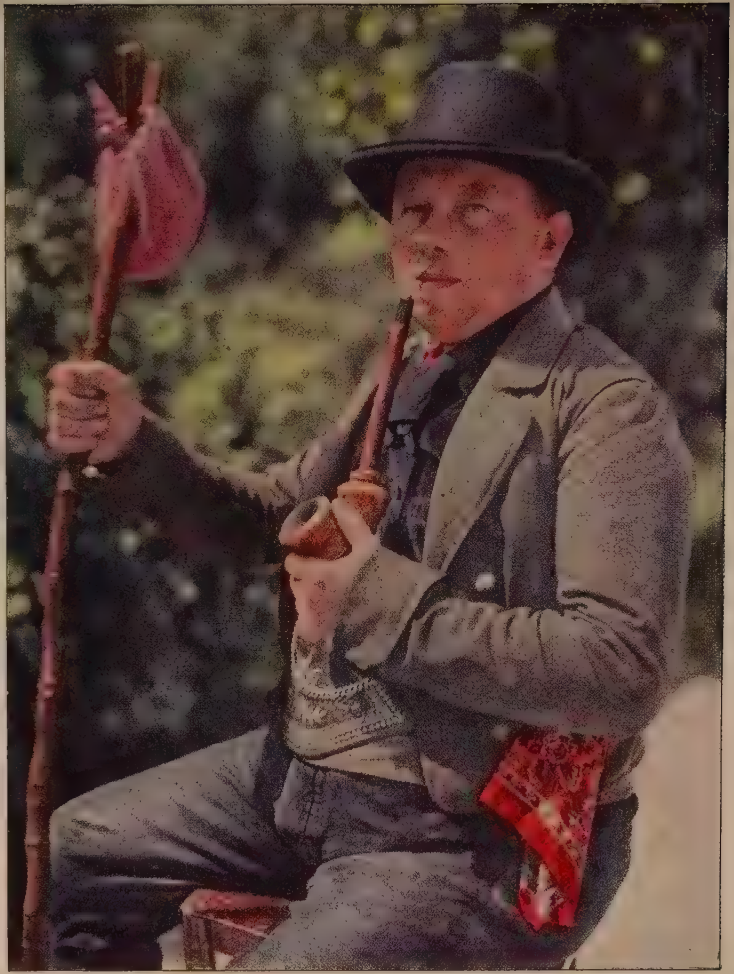
MODEST DIGNITY CHARACTERIZES THIS PEASANT WOMAN

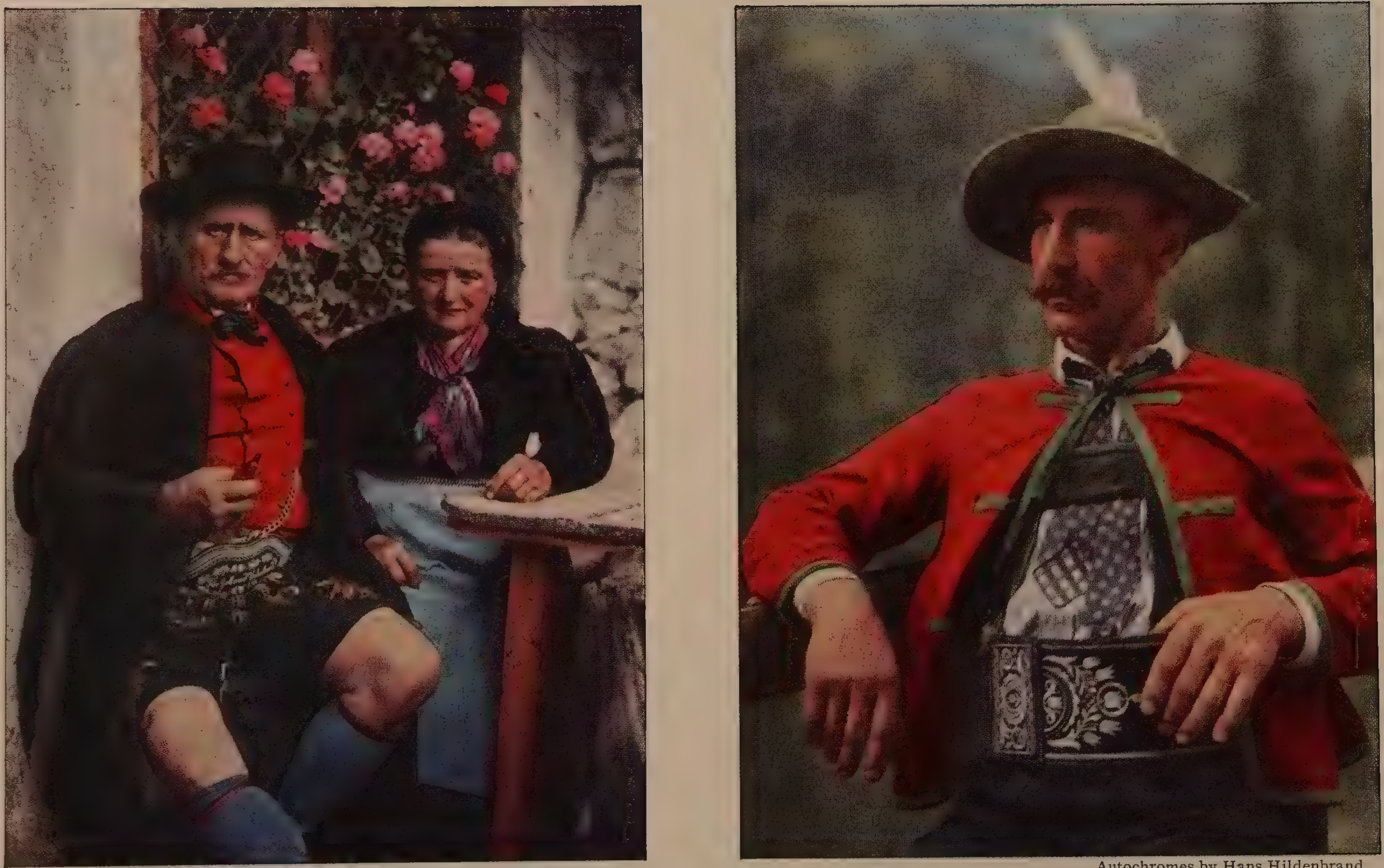
Though Bischofshofen has become a bustling modern town, the central point of junction for express trains connecting Vienna and Paris, south Slavonia and Salzburg, some of the older peasant women cling to the costume of other times.



Autochromes by Hans Hildenbrand

IN GALA ATTIRE THE CRAFTSMAN IS A DASHING FIGURE

With capacious pipe in hand and a bit of bacon and bread in a handkerchief slung over the fork of his walking staff, the worker from the country near Salzburg is ready for an enjoyable day at the market or festival.



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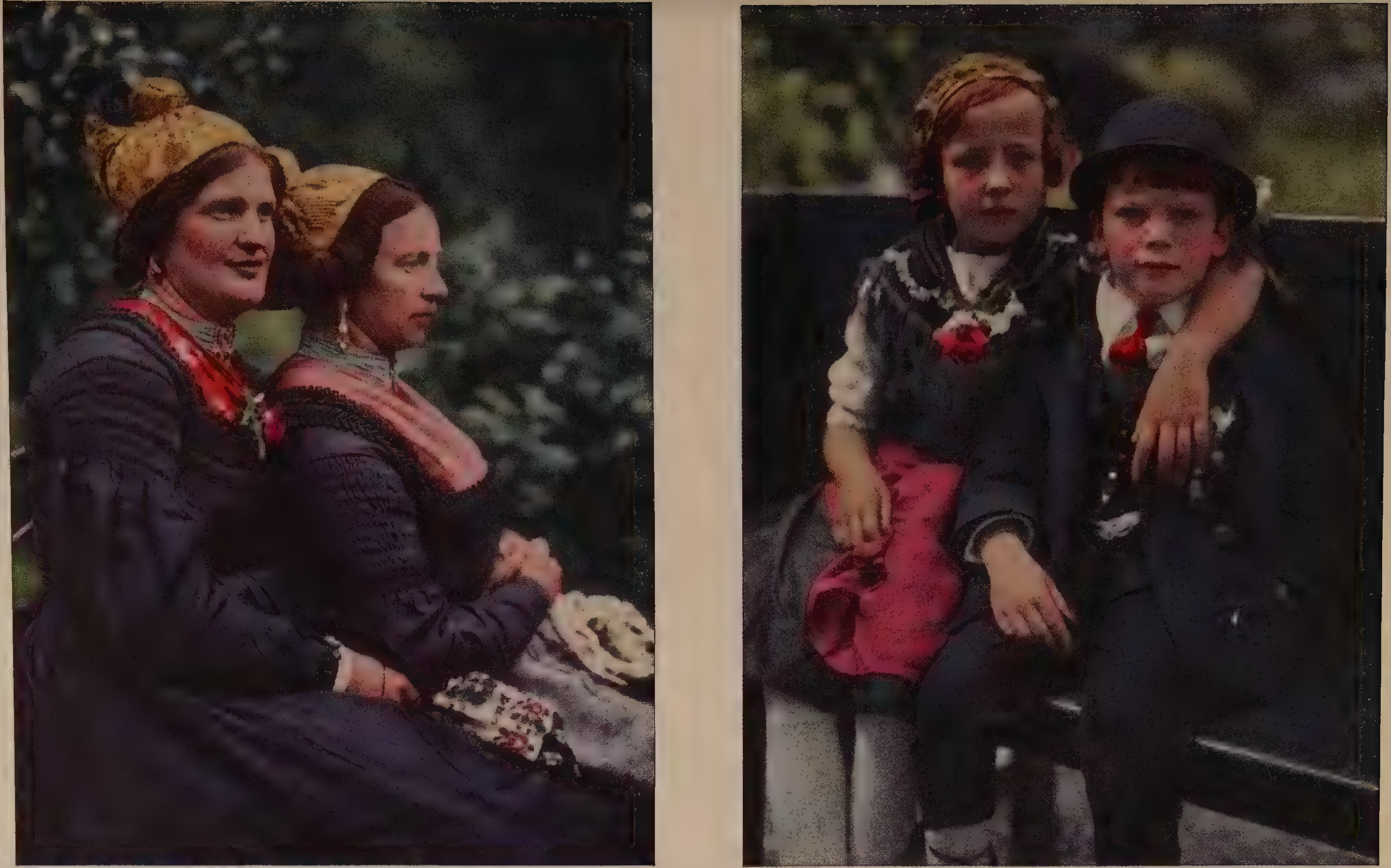
PEASANT CHARACTER IS AS STURDY AND UNCHANGING AS THE ALPS

There is something fine and proud in the calm adherence of these mountain people to their traditions of dress and custom. The robust couple live near Heiligenblut, a Carinthian village that owes its name to a phial of the "holy blood" said to have been brought from Constantinople by a saint and now kept in the 15th century church. The man with plumed hat and elaborately decorated belt is from Birnbaum in the Gailtal close to the border of Italy. During the World War his town was within range of the Italian guns.



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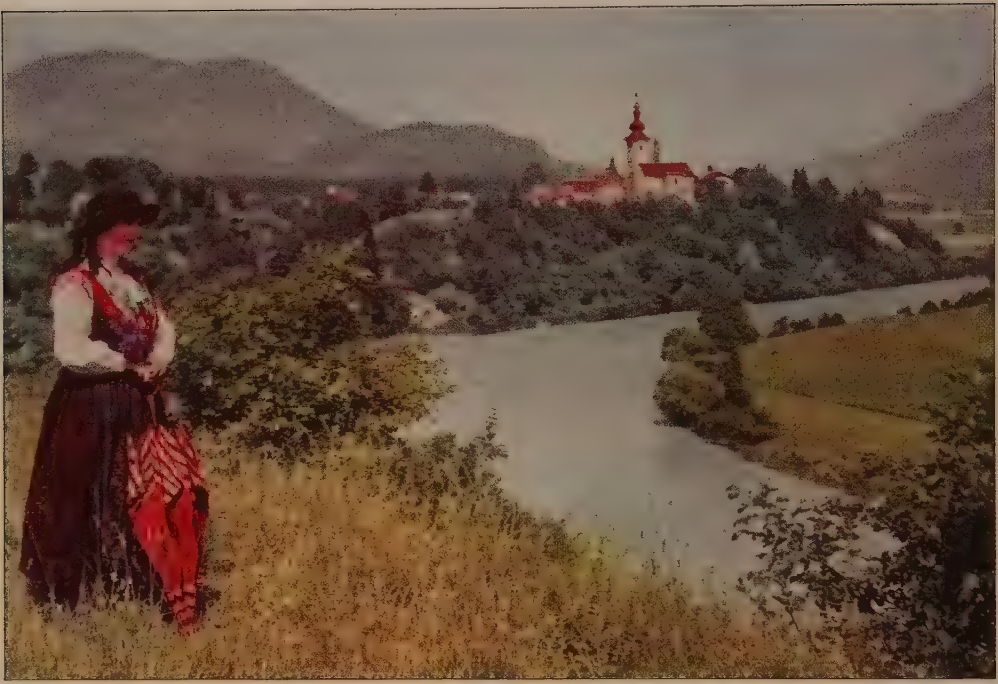
Autochromes by Hans Hildenbrand

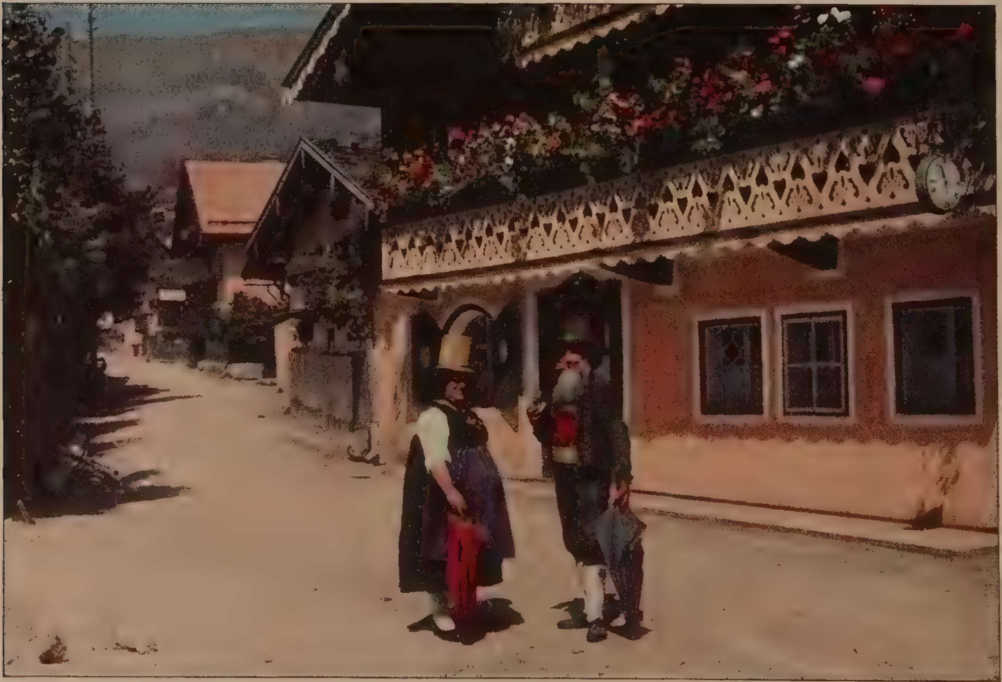
SALZBURG FOLK HAVE BEEN SLOW TO ADOPT MODERN STYLES

Peasant art and costumes are disappearing from many parts of Austria, but here the traditional attire may still be seen, particularly on fête days. The women are wearing the cherished caps woven of gold thread and embossed. The children's quaint garb has been changed little for the modern generation.



WIDE AND FERTILE IS THE VALLEY OF THE DRAVE

Though a thriving industrial center and the depot of the timber trade with Italy, Villach, second largest city in Carinthia, lures the traveler by the loveliness of its pastoral surroundings. The young woman wears a characteristic peasant costume.



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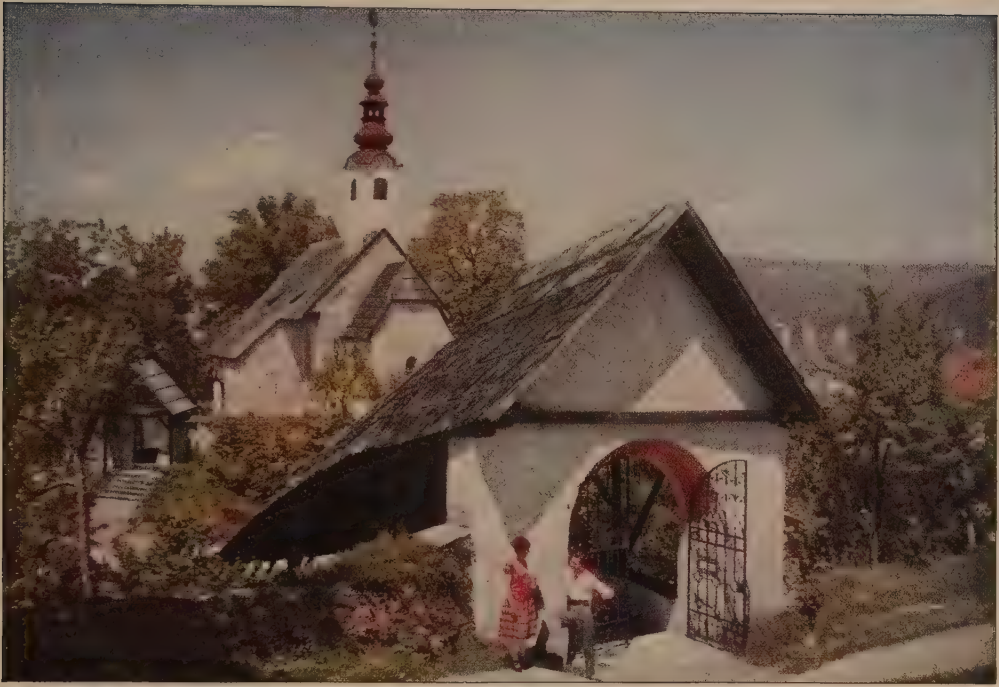
Autochromes by Hans Hildenbrand

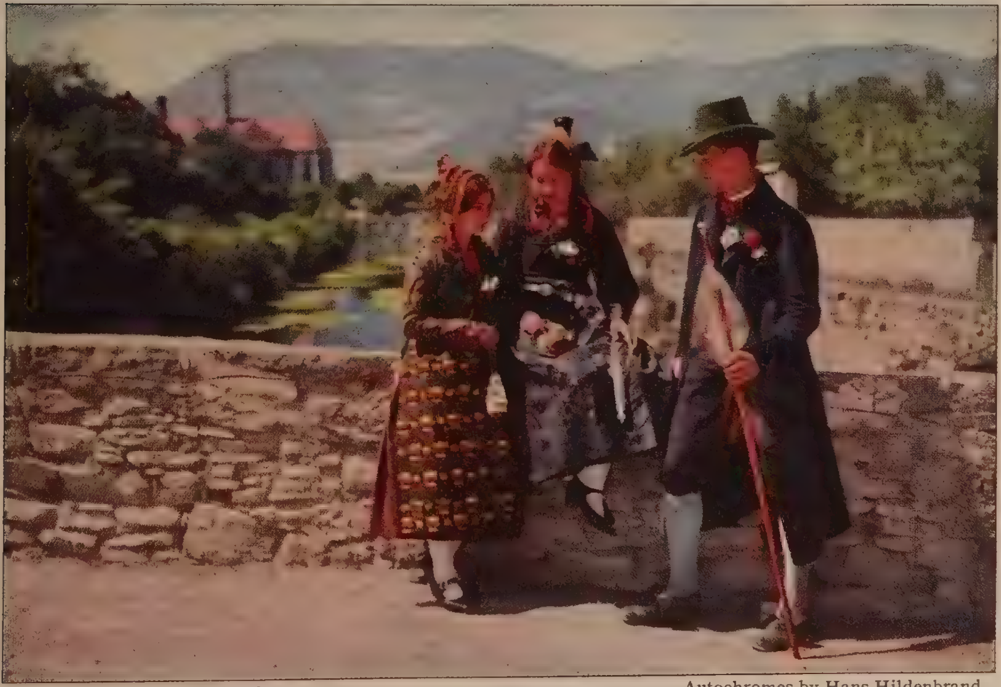
THOUGH A FAVORITE RESORT, ZELL AM SEE REMAINS UNSPOILED

Beside the jewellike Zeller See, a lake only two and a half miles long and a mile wide, but 225 feet deep, this quaint Alpine village attracts thousands of tourists both winter and summer.



CHURCH-GOING FOLK HAVE WORSHIPED HERE FOR 1,300 YEARS

One of the most interesting places in Carinthia is Maria-Wörth, on a peninsula in the Wörther-See. The ancient church is believed to date from the 6th century. Approached by the covered stairway is a second historic chapel hidden by trees.



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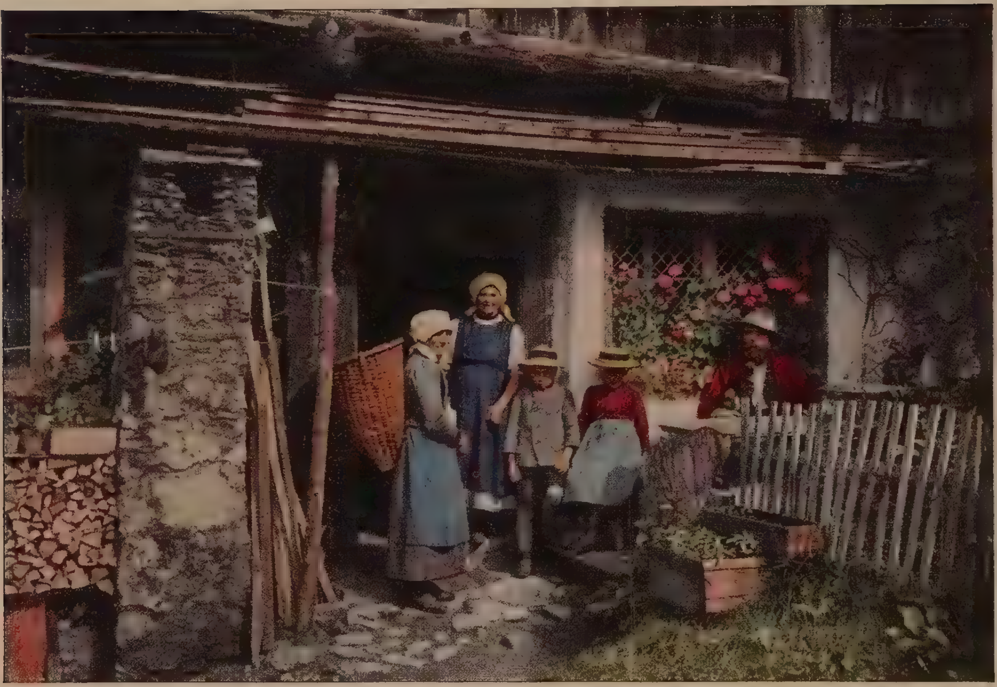
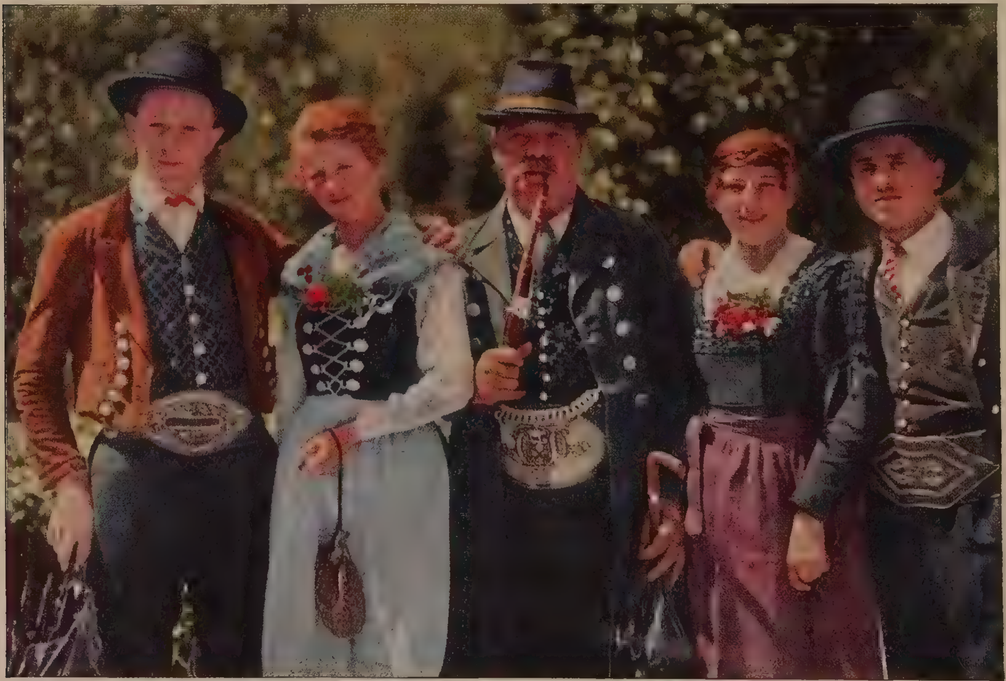
WALLS AND MOATS OF FRIESACH RECALL FEUDAL TIMES

Appropriate to the medieval setting are these young people's folk costumes. Near the town are the half-ruined castles of Petersberg and Lavant. The Dominican church dates from 1251.



THRIFT MAKES HAPPY HOMES IN HEILIGENBLUT

Although the peasant farmer of Carinthia admits the convenience of modern improvements, he somehow prefers to cling to the work methods of his ancestors. The house before which this healthy family is gathered has been handed down from father to son for many generations (see also Color Plate IV).



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THE FARMER'S FAMILY IS A CLOSE-KNIT SOCIAL GROUP

Regard of class and love of the soil characterize the peasants of Gnigl, near Salzburg. In keeping with time-honored custom, when the eldest son marries he becomes head of the house and his parents move to the smaller dowerhouse. Preservation of traditions of both dress and of labor is a matter of pride with these people.

Crossing the pergola-edged courtyard, where tenants' children were asplash in a cement wading pool, we entered that curiously futuristic-looking structure and gained a small apartment consisting of three daylit, airy rooms.

"Now you've seen one of Vienna's municipal block apartments," the captain announced.

"Do you mean," we asked, while contrasting our attractive surroundings with that bugbear of "institutionalism" which is supposed to blight such social experiments, "that this enormous flat-house is city-built, city-administered?"

He nodded. "You see, something had to be done about house-shortage and high rentals. Before the war one-fourth of a workingman's pay went for rent, while now—well, this apartment, together with gas and electricity, costs me about $5.00 a month."

And thus, due to postwar exigencies, Vienna has achieved for its working classes a housing scheme which, planned to embrace 30,000 families, is "futuristic" only because of its novelty (see illustration, page 691).

When one visits the delightful block kindergartens or the block laundries, where workmen's wives "do" their household linen, or the courtyard playgrounds, where workmen's children scamper, it seems as if some lamp-rubbing genie had obliterated yesterday's dreary tenement and planted to-morrow's community home in its place. Surrounded by a block apartment's thousand or more souls, living among conditions of health and cheer, one experiences—again the inevitable word—a singularly futuristic impression, as if beholding the advent of a new era for industrialism's centers.

VIENNA HAS TRANSFORMED ROMANCE INTO REAL ESTATE

In striking contrast to the block communities of a socialistically inclined government are the superb edifices of Austria's 600-year-old dynasty that ended with the World War. Vienna is a city of palaces and of those palatial buildings which fringe her matchless Ring. By selling the site of her medieval "ring" of ramparts for $50,000,000 and by creating instead a circular boulevard of architectural splendors unrivaled in Europe is how Vienna in mid-19th century transformed romance into real estate and became possessed of her famous Ring-Strasse (see page 690).

"L'AIGLON'S" FORMER PALACE NOW AN ORPHANAGE

A visit to one Viennese palace of many—the Schönbrunn of Versailles-like aspect—reveals the luxury of the Hapsburg régime and its postwar *sic transit* under Austria's democratic republic; for the park where Maria Theresa once strolled and where the Napoleon of 1805 planned campaigns has become a Sunday pleasance of Vienna's workers. The interminable succession of rooms, wherein "L'Aiglon," the sickly little son of the deposed Emperor of the French, wandered and fretted and withered away, is now in part a civic orphanage (see page 693).

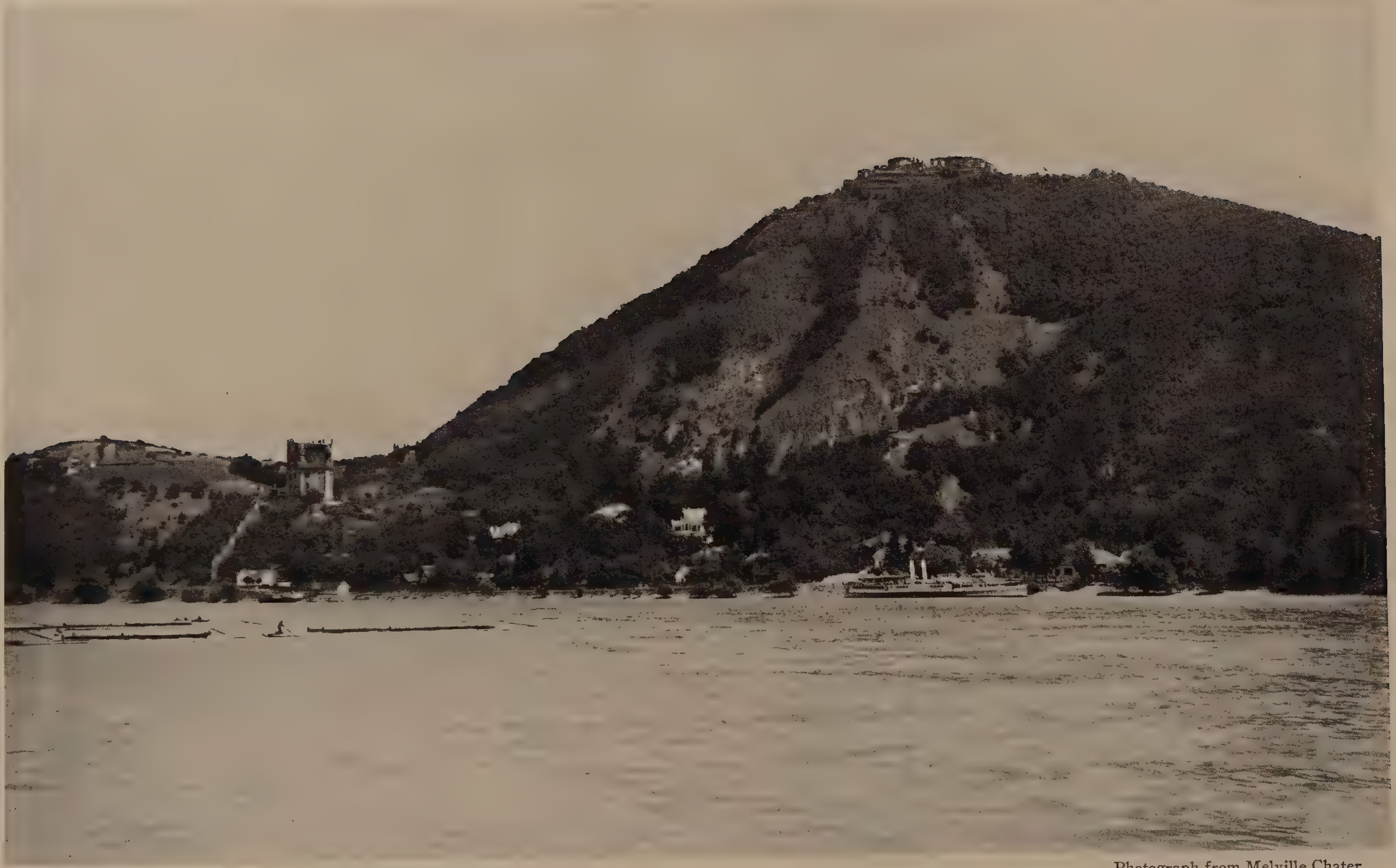
"There are 1,441 rooms and 139 kitchens in the palace and outbuildings," drones the guide, as your visiting group follows him through increasingly sumptuous suites. "The decorations in this room alone cost Maria Theresa $100,000."

"I'd hate to take that girl out shopping," remarks a weary voice. "Doc, couldn't you cut out about 1,400 of those rooms? I generally figure on twenty minutes for a palace."

Napoleon was the last great conqueror to appear on the Danube. In his descent upon the retreating Austrians, he struck at Ulm, Austerlitz, and elsewhere, winning glory and capturing sufficient cannon to melt down into the Vendôme Column.

The Schönbrunn not only saw the conqueror in residence, but later on was thrown into hysteria by the shade of Napoleon *redivivus;* for in 1815, while the Congress of Vienna was availing itself of his banishment to put the much-battered European map to rights, and overjoyed royalties were holding an endless round of champagne parties, a thunderbolt descended on the palace. The Devil (Napoleon) had escaped from Hell (Elba)! Map-makers and revelers scattered like that famous belling-the-cat conference when its mice delegates beheld a feline shadow on the window blind!

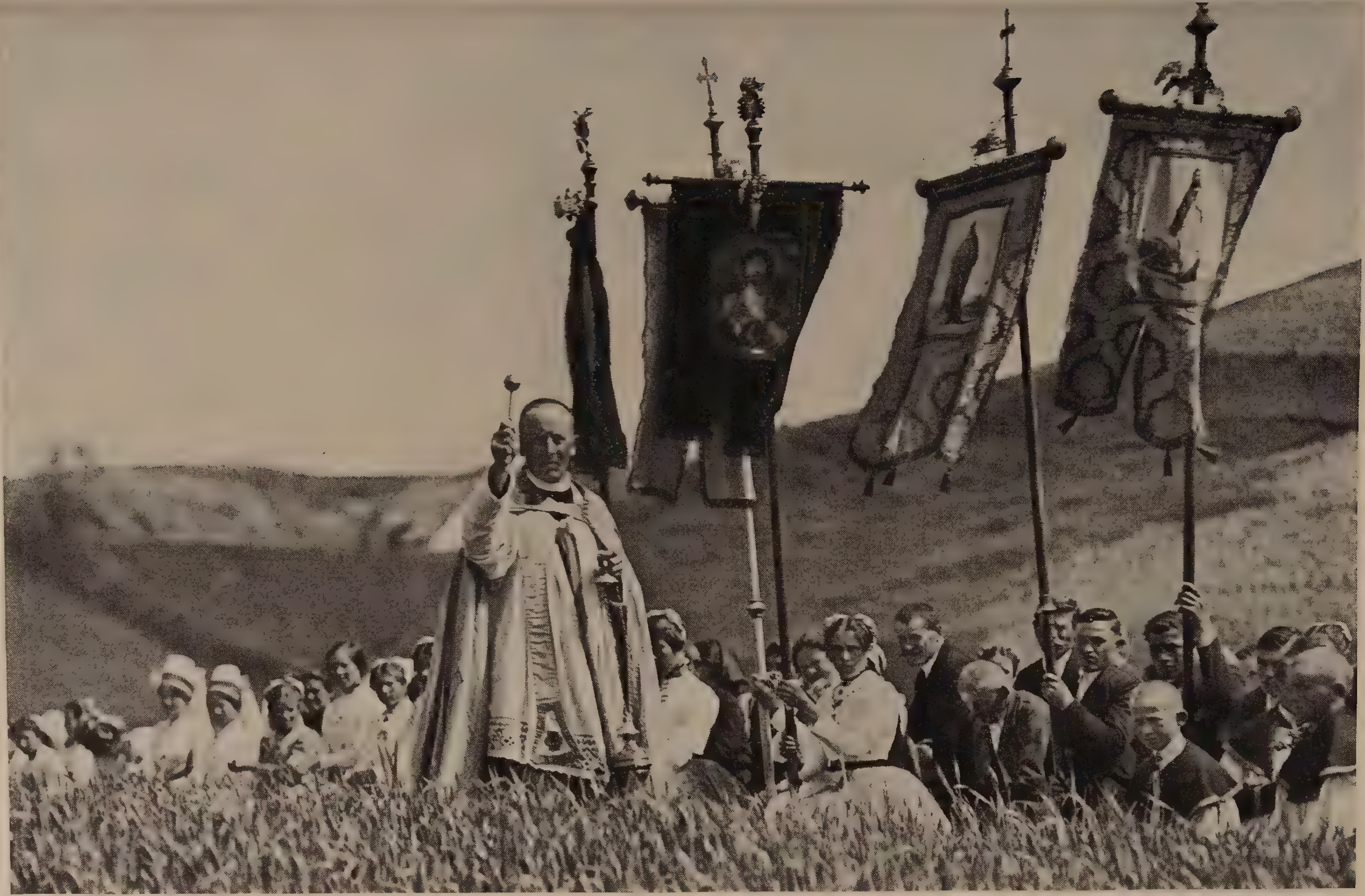
Though thrones may totter, Vienna's cafés go on forever. Incidentally, one



Photograph from Melville Chater

VISEGRAD IS PROUDLY POISED ON A ROCKY HEIGHT BY THE DANUBE

Centuries ago this castle, which is situated north of Budapest, was the seat of the summer court of the kings of Hungary, and the full flower of chivalry bloomed here. Young men of noble birth flocked to it from many foreign lands. Later came the devastating armies of the East to batter the walls of Visegrad, and the forces of Western civilization gathered to stem the onrushing Moslem tide.



Photograph from Melville Chater

BLESSING THE CROPS IS AN ANNUAL CEREMONY IN MANY PARTS OF HUNGARY

Religion plays an important rôle in the life of the peasantry. Early in the summer processions are formed in the villages, and with flying banners and led by priests, the entire populace goes out into the fields, where the growing crops are blessed.

Photograph from Melville Chater

HORSE-BREEDING IS AN IMPORTANT INDUSTRY ON THE HORTOBAGY PLAIN EAST OF BUDAPEST (SEE, ALSO, ILLUSTRATION, PAGE 663)

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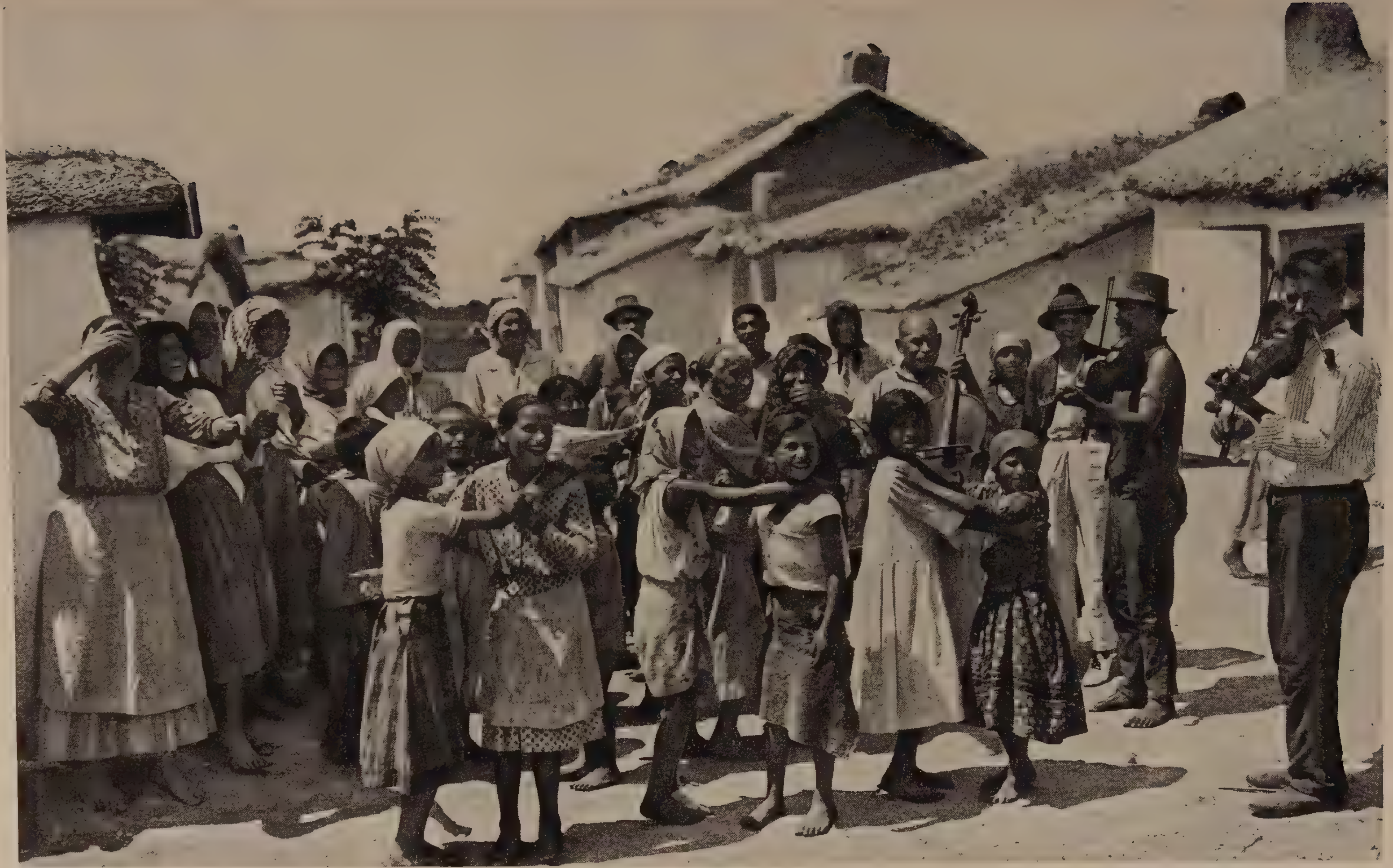
STONE PIERS AND IRON BEAMS HAVE SUPPLANTED THE BRIDGE OF BOATS WHICH LONG SPANNED THE DANUBE AT BRATISLAVA



Photograph by Ewing Galloway

GYPSY CHILDREN MAKE MERRY ON A HOLIDAY

Although known the world over as nomads, there are gypsies in many parts of central and eastern Europe who live in more or less permanent villages. The folk dances of the children and the accompanying tunes have been handed down from generation to generation. This music is the basis for many of the airs that have made Hungarian composers famous (see, also, text, page 661).

IN OTHER DAYS BRATISLAVA WAS A ROYAL CITY

For centuries the kings of Hungary were crowned at Pozsony, as this ancient community was known before territorial readjustments after the World War made it a part of the new Czechoslovak Republic (see text, page 668).

frequents those haunts of social sobriety to sip coffee, quaff beer, or consume snacks; but in reality one is there to read newspapers, play cards, write letters, or interchange language lessons. Though you sit unspending all afternoon, endless glasses of water relay themselves on your table. Is time money and space precious? Seemingly not to Vienna's beaming café proprietor.

There are 1,100 such resorts in the city, and apparently every Viennese is addicted to one particular café at one particular hour. If an habitué is ten minutes late, it's a safe bet that he has been run over by a motor car. You may frequent at choice the business man's café, the professional man's café, the bohemian's café, and — not the least interesting—the revolutionaries' café. Over the last named little tables lean long-haired, slouch-hatted villains of melodrama, plotting the downfall of almost any European State. It's a case of "Hist, comrades! At the signal, capitalist-ridden Ruritania falls into our hands! Ha! Ha!"

HOME OF MUSIC AND MUSICIANS

Skimming over the list of Vienna's good things that have carried her name abroad, one might mention Vienna rolls, Vienna beer, Vienna sausage, Vienna schnitzel, and Vienna light opera. The last-named is but one aspect of a musical tradition harking back to the Minnesingers' days, when Walther von der Vogelweide sang at Vienna's court.

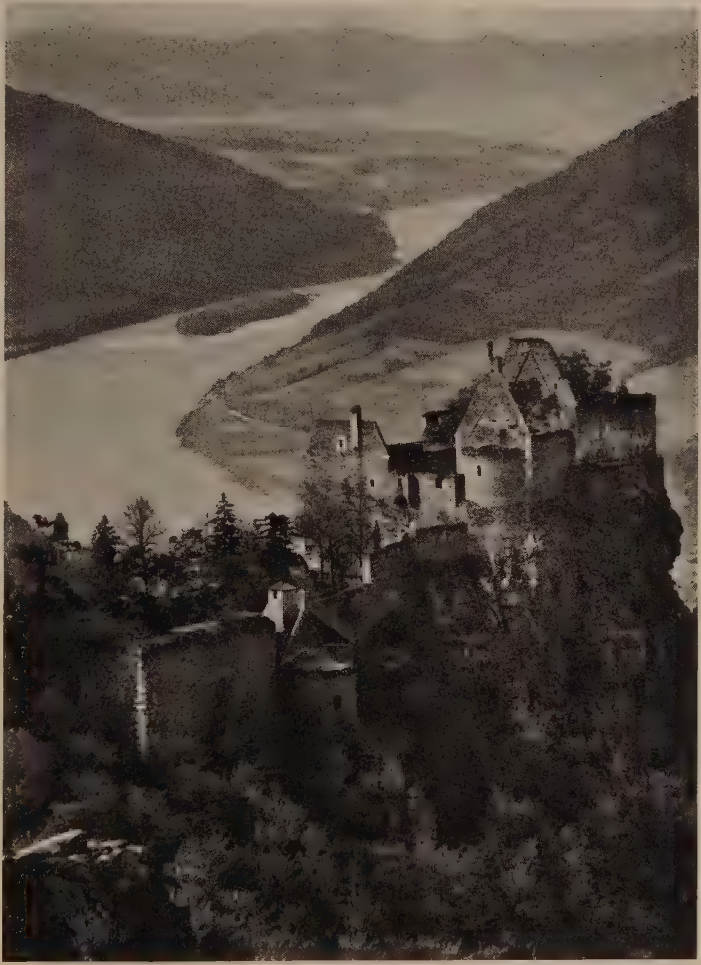
Historically, Vienna has always been the great adoptress of composers—Gluck, Mozart, Haydn, Beethoven, Brahms—who settled among her music-loving people.

Two of her native composer-sons are world property. Page that doubtful corner of the earth where the undulating measure of "The Blue Danube," instinct with ghosts of waltzers twirling toplike, has never been heard! What if the Danube is, in fact, mud-colored, with light-greenish hues at low water? To anyone who has ever loved that waltz, the Danube will remain forever blue. How many millions of feet have moved to its rhythm since composer-bandmaster Johann Strauss first played it at the Vienna Carnival of 1826!

No such easy fame befell Franz Schubert. Leading a hand-to-mouth existence, he produced in his short lifetime compositions enough to furnish half a dozen reputations. In his eighteenth year alone he created 25 major pieces and 146 songs. He composed so spontaneously that music seemed to leap fully born from his brain; yet after his death his estate was found to consist of manuscripts whose probate value was less than three dollars!

Vienna, during our visit, was decked forth for his centenary. "Schubert schillings" had been struck to honor the man who was so often penniless. Silent multitudes stood massed in public squares to hear his music. "From the heart it came, to the heart it shall go," spells the universal appeal of that simple-souled genius, melodist of joy and sorrow.

And one musn't forget Vienna's beloved, if apocryphal, "lieber Augustin," that little folk-singer of the battered hat, ragged clothes, outturned pockets and bagpipe. One night in 1679 Augustin, drunk as usual, fell into a plague pit. Reviving next morning, he sat up among the corpses and caroled forth, "Money's gone, sweetheart's gone, Augustin's in the dirt," setting it to the infectious lilt that was to invade the world's yet-unborn kindergartens. And whoso doubts this tale of optimism triumphant may visit Vienna, where, on a street corner, Augustin's little statue pipes to passers-by, *"Ei, du lieber Augustin, alles ist hin!"*



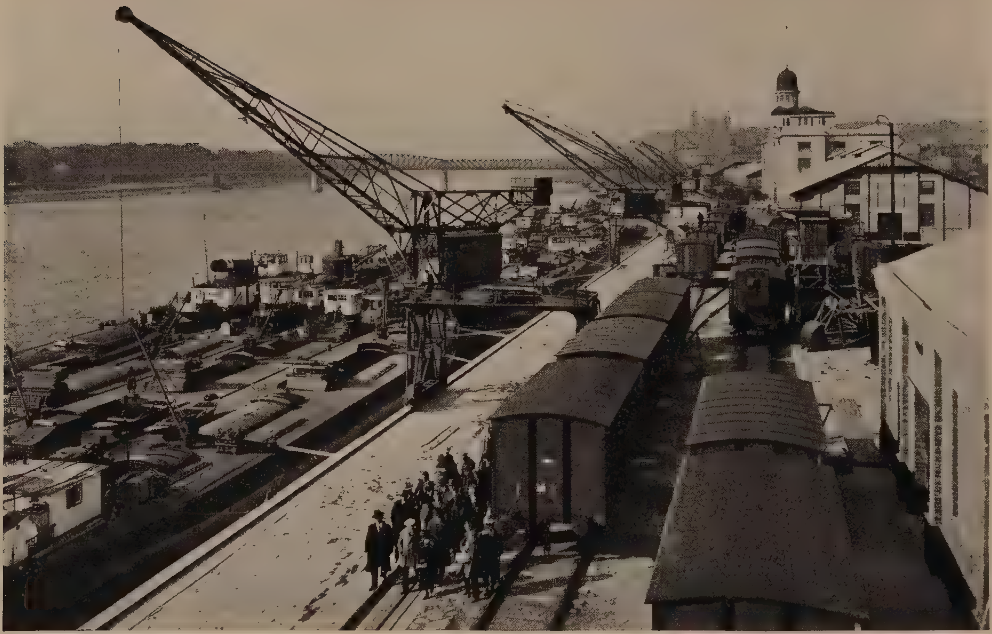
Photograph by Bayer

AGGSTEIN WAS LONG A DREADED NAME ON THE DANUBE

None of the robber strongholds which dotted the heights along the river in medieval days had a more fearsome reputation than that occupied by the lords of Aggstein. From their impregnable perch they laid heavy tribute on passing cargoes and defied all efforts to dislodge them.

BIG BUSINESS FOR DANUBE CASTLES DURING THE CRUSADES

Once more aboard the *Patria,* with Greifenstein's fine old castle rising into view, we asked the skipper if we weren't nearing the Danube's region of medieval strongholds. He assented, adding that he wondered why Americans liked old ruins. But skyscrapers, now! . . . Enthusiastically he depicted the skyscraper as the



Photograph from Melville Chater

WHERE RAIL AND RIVER TRAFFIC MEET

Since the World War Bratislava (Pressburg) has developed into Czechoslovakia's principal port on the Danube (see, also, illustration, page 680).

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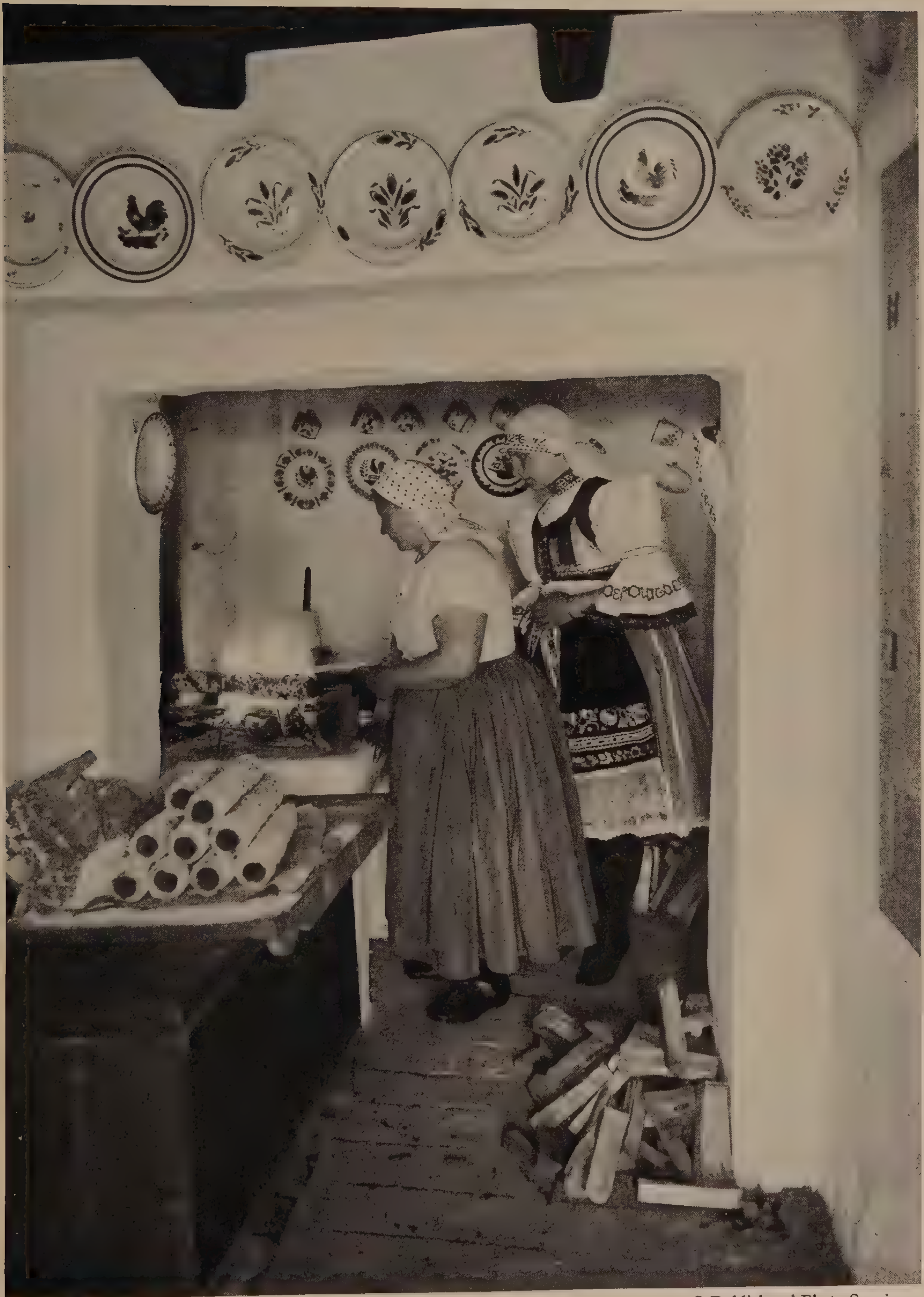
HERODOTUS WROTE OF THE HONEY RESOURCES OF THE DANUBE

The air hums with the music of bees at work gathering honey from broad acres of buckwheat blossoms in the vicinity of this apiary in southern Czechoslovakia, but Herodotus may be said to have exaggerated somewhat when, in a report written 24 centuries ago, he declared that vast bee armies made certain Danube regions uninhabitable (see page 647).



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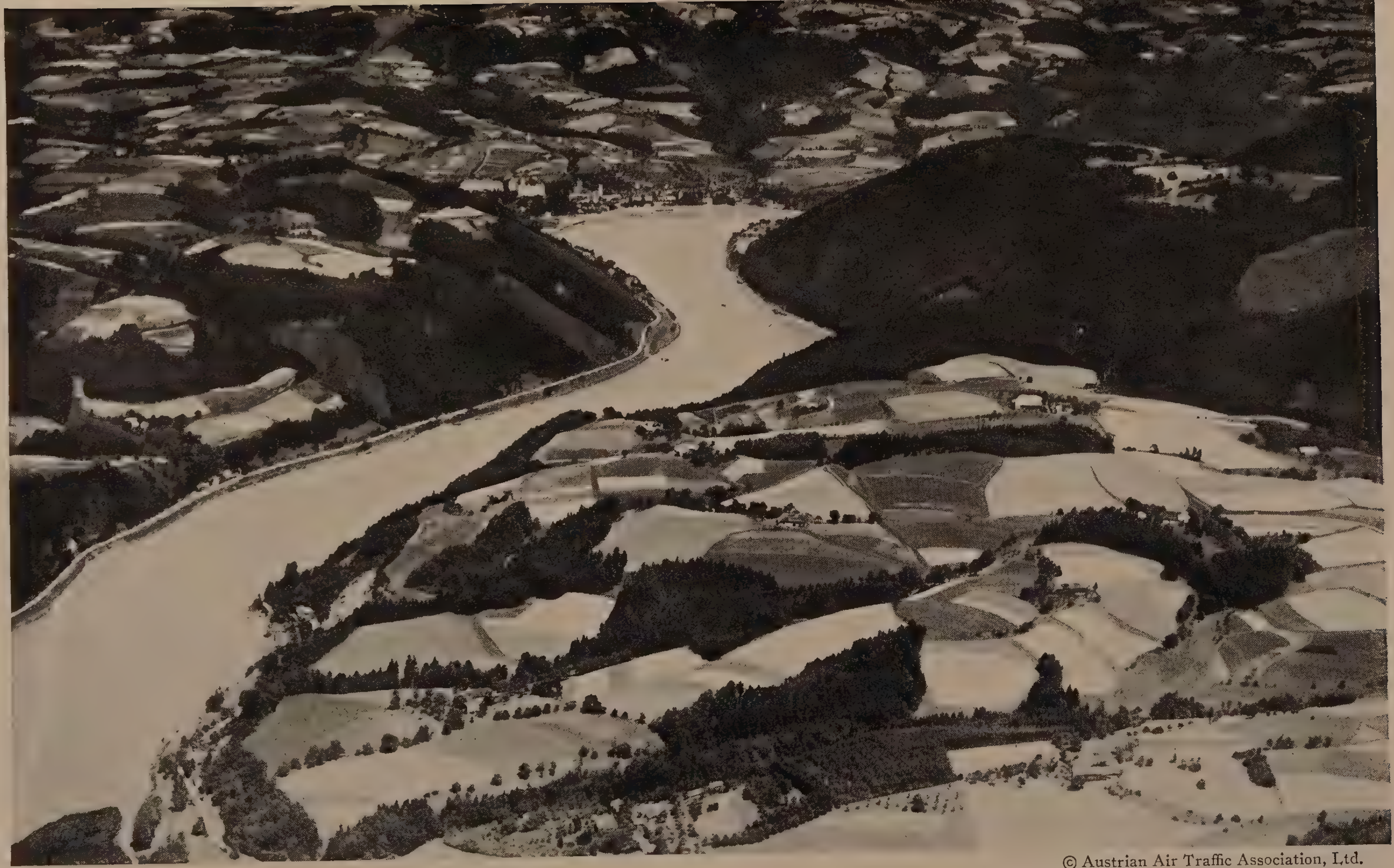
CAKE-MAKING IN A CZECHOSLOVAK PEASANT KITCHEN

In villages of central Europe the kitchen frequently serves as a general living room, a dining room, and perhaps as a place to sleep, in addition to its normal functions. The cakes made by these women are baked on rollers over an open fire. Some of the finished products are on the table in the foreground.



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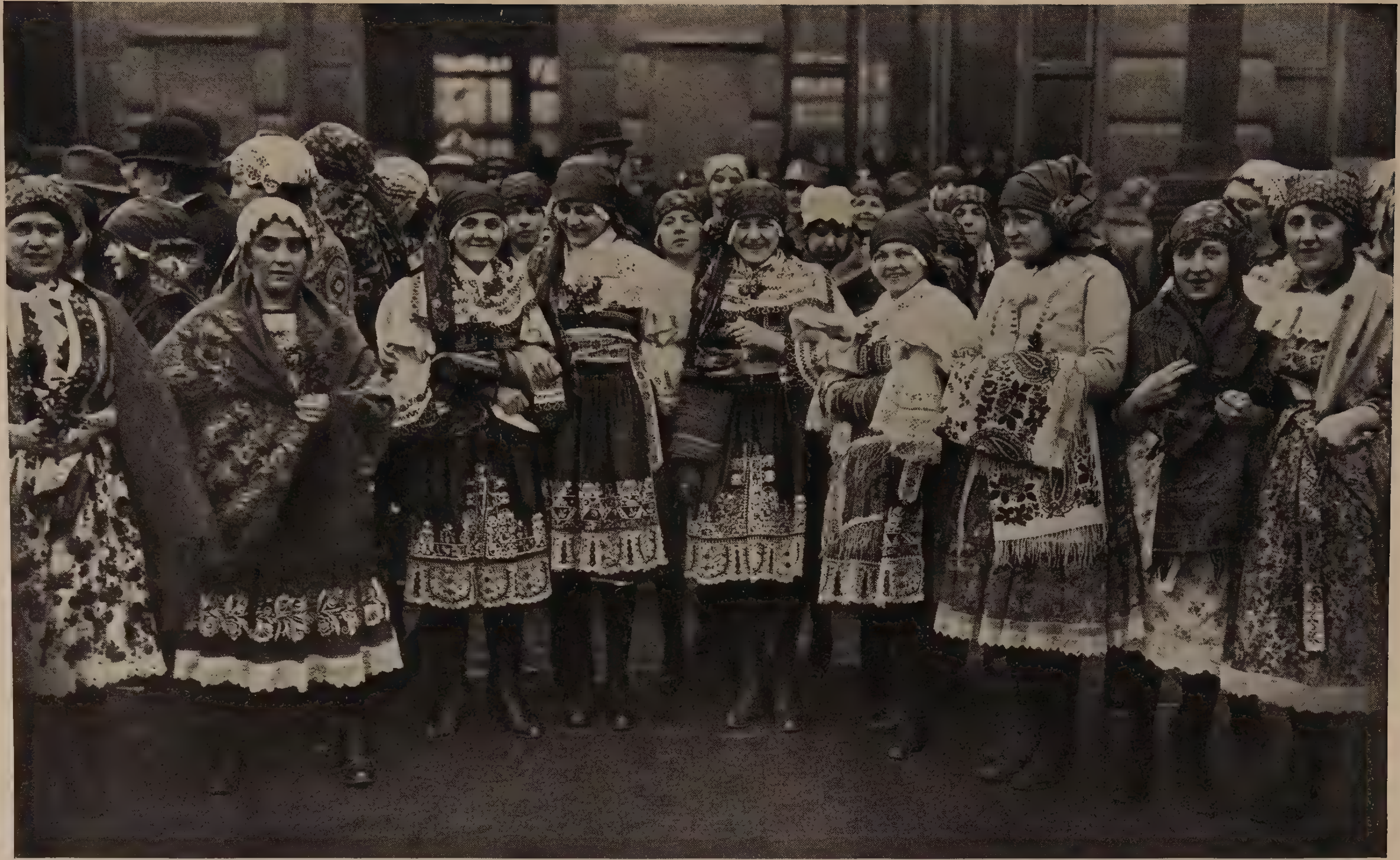
NEAR THE AUSTRIAN TOWN OF GREIN THE DANUBE WINDS THROUGH ALTERNATING STRETCHES OF WOODED HILLS AND ROLLING CULTIVATED FIELDS

Austria, for many years an industrial nation, has found it necessary since the World War to give more attention to agricultural pursuits. That her people are succeeding in this new line of endeavor is indicated by the remarkable increases in her crop yields in the past decade, many of them totaling more than 100 per cent.



ON HOLIDAYS CZECHOSLOVAKIAN GIRLS DISPLAY THE BRILLIANT COSTUMES OF THE PAST

Commercial and industrial contacts with the western European world have caused a decline in the use of the colorful national costumes. They still appear, however, on occasion and are more often seen in conservative Slovakia than in Bohemia.

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MELK'S MAGNIFICENT MONASTERY IS ONE OF THE GLORIES OF THE DANUBE

Erected in the early 18th century, on the site of an older establishment, this Benedictine foundation in Austria is a noble example of ecclesiastical Roman architecture. It commands a rare view of the river and of the wooded heights beyond.

American castle of industry. He said he'd like to see every defunct Danube castle replaced by a 50-story business edifice.

But why not regard the Danube castle as having been in its day the busy skyscraper of medievalism? Steaming past the Wachau Defile's crag-set ruins, we reflected upon the formidable amount of trade that fell to them as a result of the Crusades.

In 1096 some 2,000 craft, packed with 40,000 Palestine-bound troops, descended the Danube. Three ensuing Crusades took the same route. There sprang up a river trade consisting of westbound silks, bronzes, spices, oils, and of eastbound furs, arms, and saddlery. And the Danube castles took their river tolls and the flotsam-jetsam rake-off of stranded cargoes, not to mention piratical seizures and the enslaving of ships' crews.

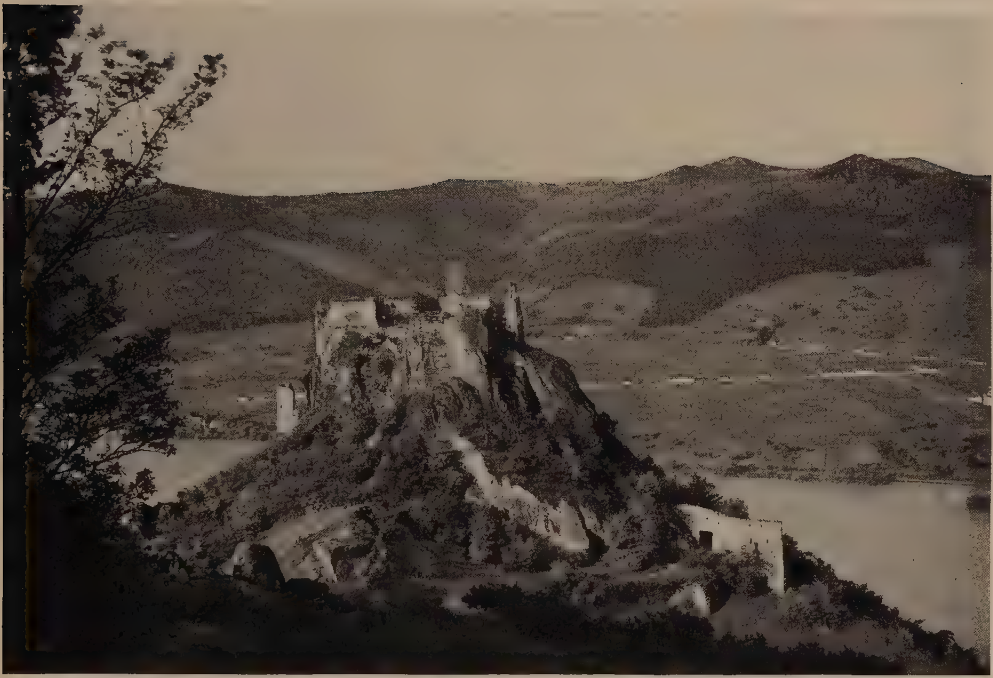
Castle Aggstein, the most dreaded of Danubian robber strongholds, must have had a big turnover in riparian loot and captive maidens. And Castle Dürnstein eclipsed all local records in the capture-and-ransom trade when its gates closed upon that royal prize, Richard Cœur de Lion (see pages 683 and 689).

Yes, the more we studied the Wachau's crag-set castle ruins, reflecting on their crime-soggy past, the more we relished the captain's fancy of replacing them with American skyscrapers. What a meting out of poetic justice it would be to transform bloody Aggstein into, say, the Aggstein Life Insurance Building, and untrustworthy Dürnstein into the Dürnstein Loan and Trust Company!

A "GHOST" IN RICHARD THE LION-HEART'S CASTLE

Dürnstein proved to be a quaint little town, tucked behind medieval walls, frowned upon by a ruin-crested rock, and enlivened by many a cosy "Gasthof Richard" and "Bierhaus Blondel."

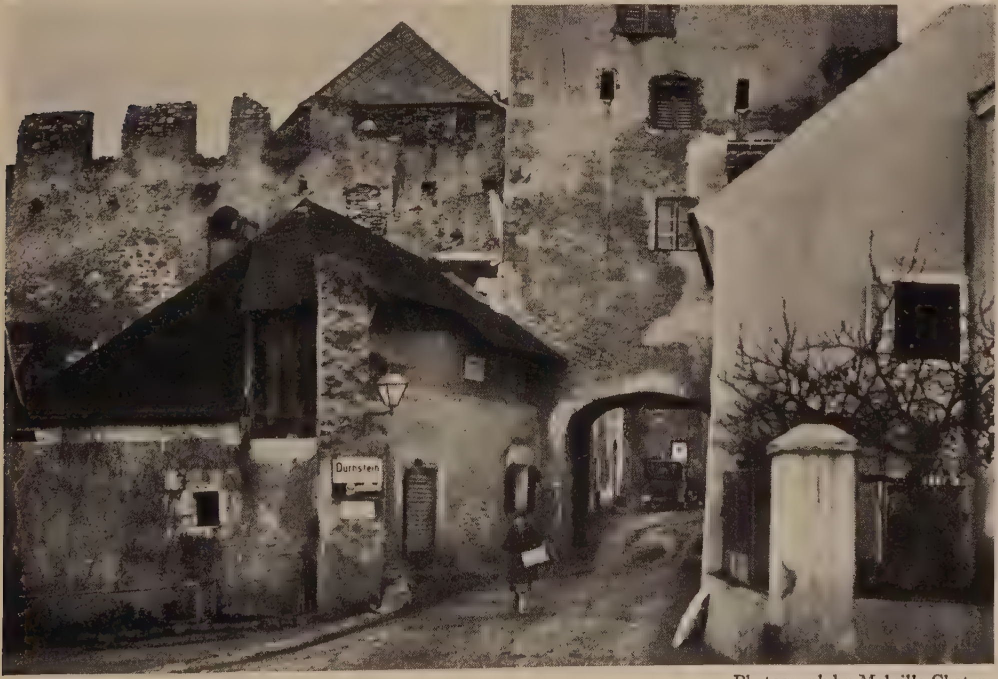
Recalling the old tale of Richard's secret prison and of his faithful minstrel's singing quest from castle to castle, we asked our host at the Café Lion-Heart if he couldn't produce Blondel's original



Photograph by Osterreichische Lichtbildstelle

MEMORIES OF CŒUR DE LION CLING TO THE TOWERS OF DÜRNSTEIN

Here Richard I of England languished a prisoner for more than a year after his capture by Duke Leopold VI, following the Third Crusade (see text, opposite page).



Photograph by Melville Chater

TINY DÜRNSTEIN ONCE SUCCESSFULLY DEFIED A GREAT ARMY

During the War of the Austrian Succession, Maria Theresa's enemies, marching on Vienna, appeared before the walls of Dürnstein. There were no soldiers inside, but the stout-hearted citizens blackened logs and drain pipes to look like cannon and placed them in the embrasures. They convinced the invaders that the place was too strongly held to be attacked.

Photograph by Postkarten-Industrie A. G.

VIENNA'S RING-STRASSE IS A NOBLE BOULEVARD

The building in the left foreground is the House of Parliament, with the Pallas-Athena Fountain in front. In the distance to the left rises the tower of the City Hall. In the background the University of Vienna and the twin spires of the Votive Church are visible beyond the mass of foliage (see, also, text, page 677).

harp; but he said he would blush to stoop to such practices. He did, however, invite our attention to an old-fashioned book. It gave the Provençal words of the Blondel-Richard duet, adding, "And still at moonlight, it is said, the shepherd passing Dürnstein's hoary tower hears mysterious harp strains mingled with two ghostly voices, which bear the chanson that Richard and Blondel exchanged on this spot ages ago."

We took our host's advice and visited the adjacent castle at moonrise. As we neared the silver-bathed ruins, there floated from somewhere the strains of a tenor voice:

Donna, vos beautas
Elas bellas faissos. . . .

Ghosts of the troubadours! It was 12th-century French; it was Blondel's chanson! ("Lady beautiful, yet cold as air, exciting to passion, yet shunning me, I wait in patience.") Then, after some harplike tinklings, a basso voice responded:

Si bel trop affansia
Ta, de vos, non partrai. . . .

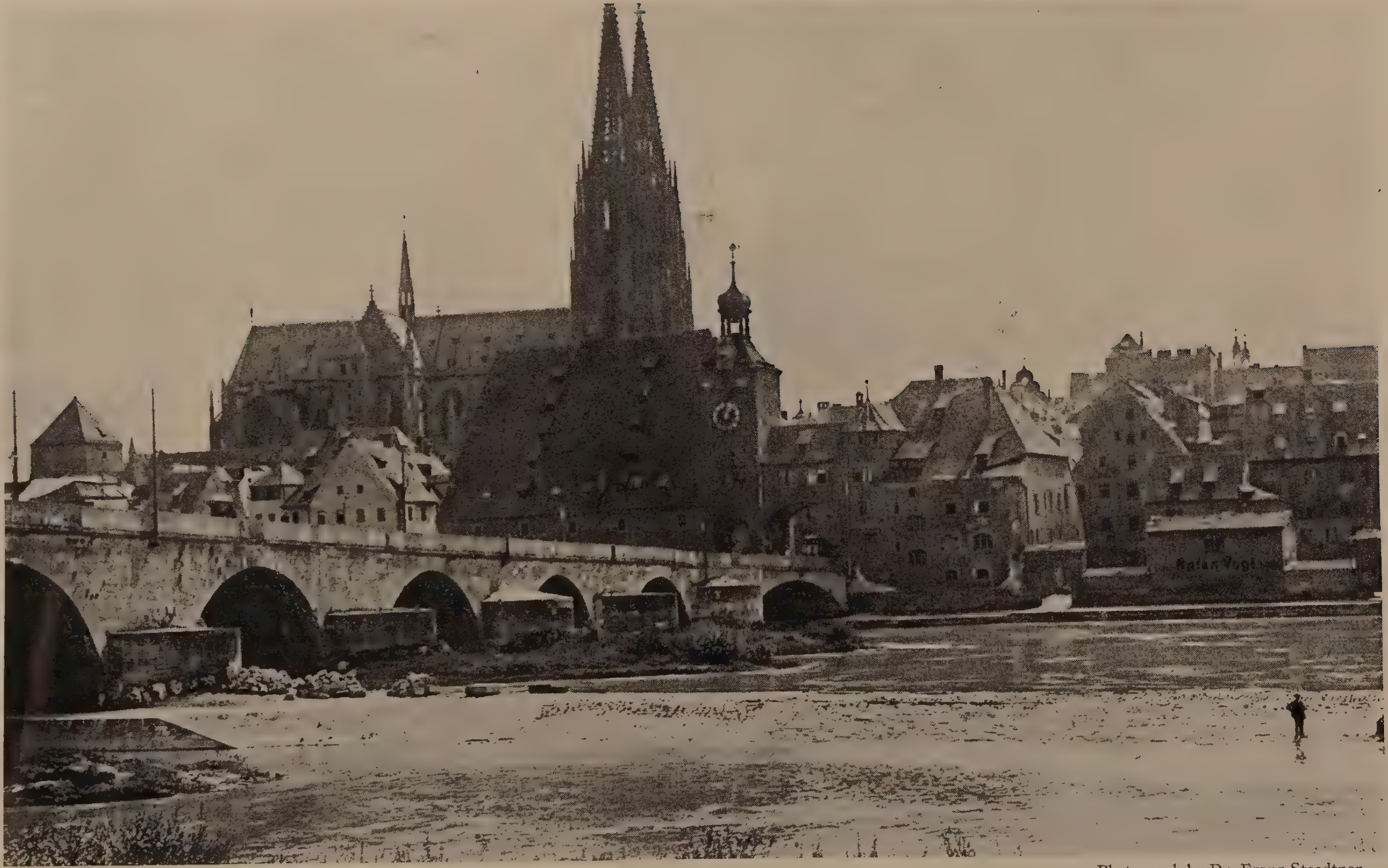
THEIR MOTHERS HAVE TO WORK AWAY FROM HOME

Kindergartens for these Viennese children are maintained by the city, often in the apartment building where they live.

Photograph by Postkarten-Industrie A. G.

VIENNA IS PROUD OF ITS FINE APARTMENTS FOR WORKINGMEN

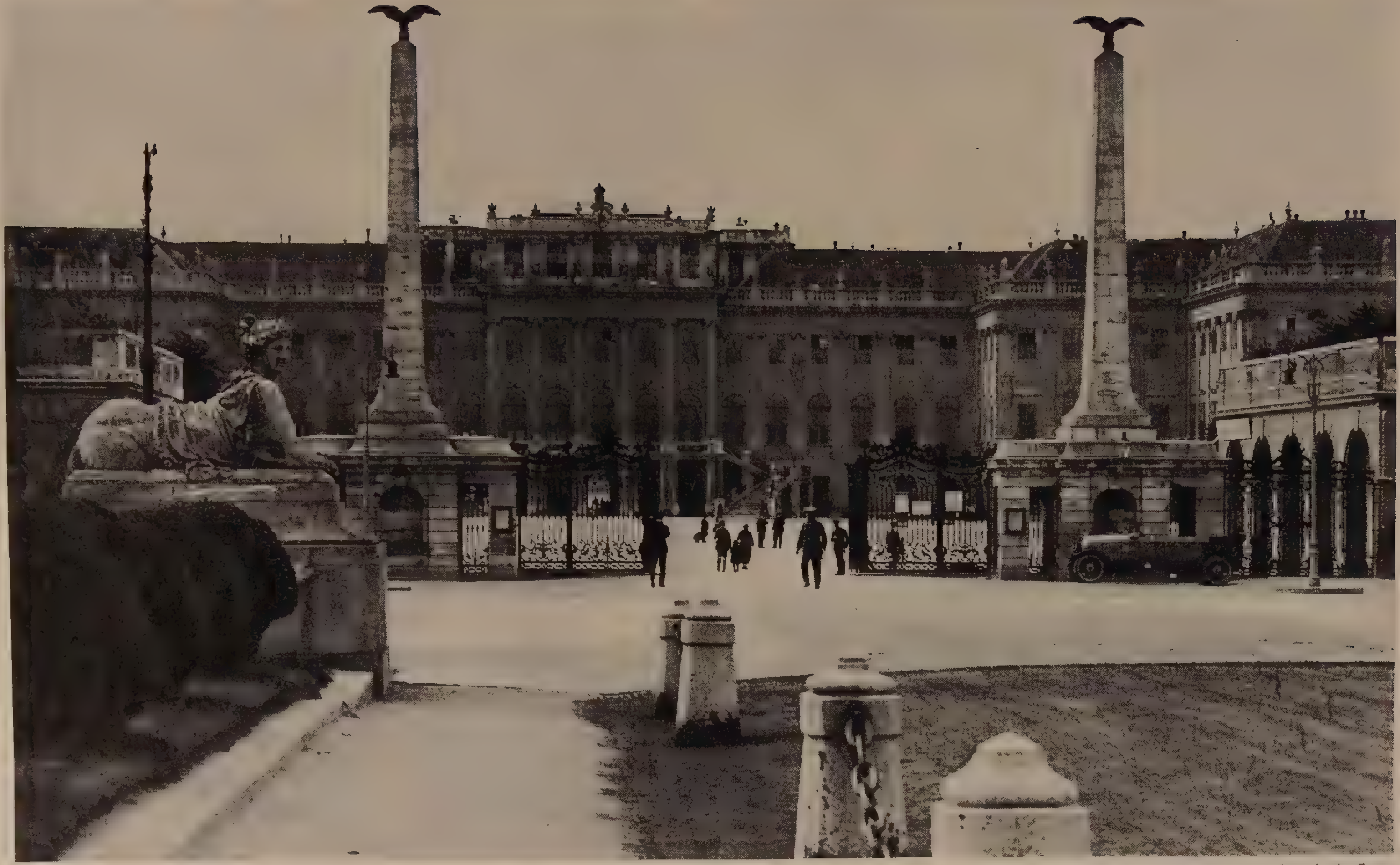
The municipality has built a number of these buildings, in which pleasant living quarters are provided at very low rentals. In some of them a single central kitchen provides meals for all who wish to avail themselves of its service (see, also, text, page 668).



Photograph by Dr. Franz Stoedtner

FROM A MEDLEY OF MEDIEVAL ROOFS RISE THE DELICATE TWIN SPIRES OF REGENSBURG'S CATHEDRAL

The city claims a lineage that goes back to 179 of the Christian Era, when Marcus Aurelius founded a Roman camp here. It was an important center of early German art and culture, and its beautiful cathedral, begun in 1275 and not completed for nearly six centuries, is one of the great Gothic churches of Europe.



Photograph by Postkarten-Industrie A. G.

SCHÖNBRUNN PALACE NOW HOUSES A VIENNA ORPHANAGE

This was one of the favorite residences of Emperor Franz Josef, who died here during the World War. Much of the present building, like the Royal Palace at Budapest, was built under direction of the energetic Maria Theresa in the 18th century. Some of the rooms of the palace are maintained in their former splendor as a museum; others are used to house homeless children (see, also, text, page 677).

Photograph by Karl Obert

SCHLOSS SIGMARINGEN IS OF RECENT CONSTRUCTION

The princes of Hohenzollern lived in this pleasant town above Ulm, on the upper reaches of the Danube, and from here they went out to win for themselves imperial honors. The present castle, towering proudly on its steep rock, was rebuilt in 1893.

Again the ancient *langue d'oc,* King Richard's response! ("I take no wound from her who divides her favors. Oh, rather hatred than thus share love with others!")

Yes, it was all very ghostlike and thrilling—that is, it would have been if, upon descending to the Café Lion-Heart, we hadn't caught our host in the act of taking off the chanson phonograph record and putting on that of "Give Your Little Baby Lots of Lovin'!"

For three more days we wound through upper Austria's plains, where lies pleasant Linz, and around curves inclosed between some of the finest of wooded heights on the Danube. Beyond lay Passau, with its barge-crammed port and its 17th-century house gables, extending tonguelike between the joined waters of the Danube and the Inn.

OUT OF AUSTRIA, INTO BAVARIA

That we were out of Austria and in Bavaria became hourly more evident by passing glimpses of towns whose Gothic towers and crow-stepped gables lifted over the stream. But, as we neared Regensburg, a Danube-dominating monument caused us to wonder if we were in a land of things Gothic or things Greek. To plant a Parthenonesque temple on a German hillside and give it the Scandinavian name of "Walhalla" was the florid feat of Ludwig I of Bavaria. No calm-limbed Apollo or ox-eyed Hera presides therein, but instead six titanic Valkyries, who loom above the busts of Teutonic kings, statesmen, generals, scientists, poets, which line this extraordinary Hall of Fame (see page 697).

But why wrench architecture from its native landscape? The flash of marble columns by Ægean seas is one beauty. The shadowy genius of Gothicism, brooding under its northern skies, is another. Of the latter beauty is Regensburg, an etchinglike town of 13th-century gateways, of oriel windows opening on cobbled courts, of stone friezes whose figures, in kingly panoply or knightly mail, look down at you from church façades.

REGENSBURG'S FAMOUS BRIDGE HAS SEEN A MARVELOUS PAGEANT

Even as Nuremburg is a living picture of the 16th century, so Regensburg is a picture of the yet earlier Gothic and Romanesque periods. Here are tall defense towers, eloquent of an age of all-powerful nobles. Here are dim tapestries and priceless hoards of goldsmith's work, equally eloquent of the days when Bavarian guildsmen aspired to art perfection as a form of piety.

Photograph by Karl Obert

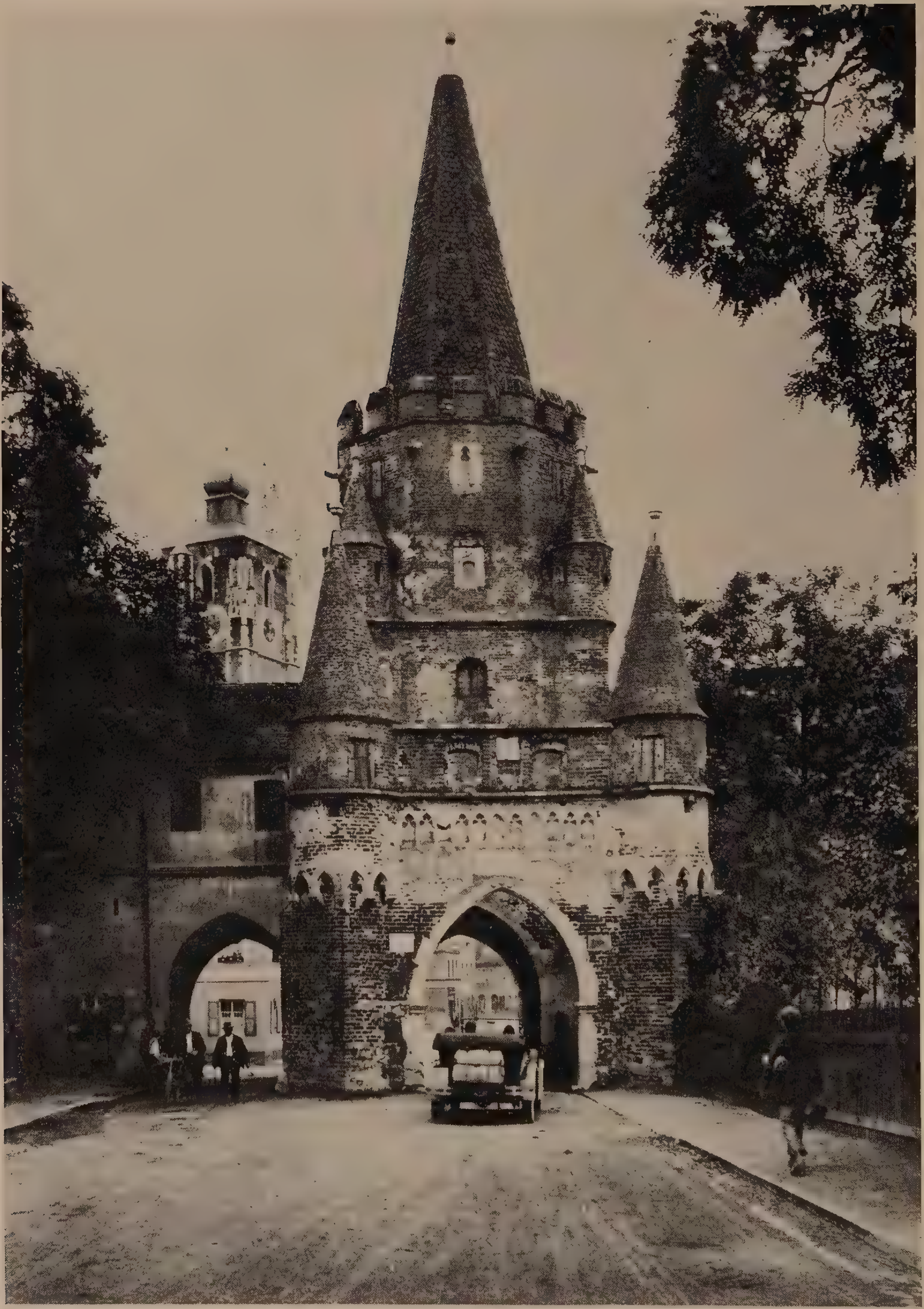
GRAPE HARVESTERS OF KAISERSTUHL, IN BADEN

The fame of the excellent wine of this district has spread far beyond the German borders.

Here also are monkish manuscripts breathing of a time when medieval man everywhere sensed the devil's machinations. Thus Regensburg's cathedral contains the soul-admonishing statue group of the devil and his grandmother, and Regensburg's bridge couldn't possibly be completed until the devil had been promised the souls of the first three beings who crossed it. However, the wily architect dodged this pact by sending across the bridge a dog, a cock, and a hen; whereupon the foiled fiend vanished amid fumes of brimstone.

For eight centuries that bridge has watched the Danube's ever-changing pageant. It saw the Crusaders' fleets. It saw five ensuing centuries of stagnation, when, owing to the upstream thrust of Tatar and Turkish hordes, traffic moved via Europe's sea routes, and the great river, given over to piracy, sank into eclipse. It witnessed a 17th-century trade revival, when sailboats, bearing freight and passengers between developing market towns, took ten days to descend to the middle Danube. And finally, in 1817, it beheld the freak craft of a Hungarian who, borrowing transatlantic ideas, actually made paddle-wheel boats move by steam.

That ancient bridge marks the limits of commercial navigation on the Danube. Regensburg is the westernmost of its 18 harbor towns that, as distributing centers, handle annually some 6,000,000 tons of river traffic for interior points and for the 8,000,000 people living on the Danube's shores. That figure is still under one-half of its prewar traffic and is far behind the enormous volume now trans-



Photograph by Ewing Galloway

IN THE 16TH CENTURY INGOLSTADT HAD A UNIVERSITY WITH 4,000 STUDENTS

The old Bavarian city was once of considerable importance and figured prominently in the controversies of the Reformation. General Tilly, famous soldier of the Thirty Years' War, died here in 1632. The Kreuztor, or Cross Tower, formed part of the ancient town walls.

Photograph by Melville Chater

"THE GERMAN TEMPLE OF HONOR STANDS ON A MOUNTAIN BY THE DANUBE"

Built by Ludwig I of Bavaria about a century ago, this stately, Parthenonlike edifice, near Regensburg, is one of the most impressive sights along the great river.

ported on the highly industrialized Rhine.

By post autobus we continued to follow an ever-narrowing Danube. At Kelheim we passed its last deep gorge, where ascending fishing boats must be hauled ahead by long lines attached to rings in the rock faces.

We spent a day inside the medieval walls of Ingolstadt, once noted for the university attended by Dr. Faustus of black-art fame. We lingered another day where Ulm's tremendous Gothic spire, almost as lofty as the Washington Monument, towers over the Danube.

AT THE HEADWATERS OF THE DANUBE

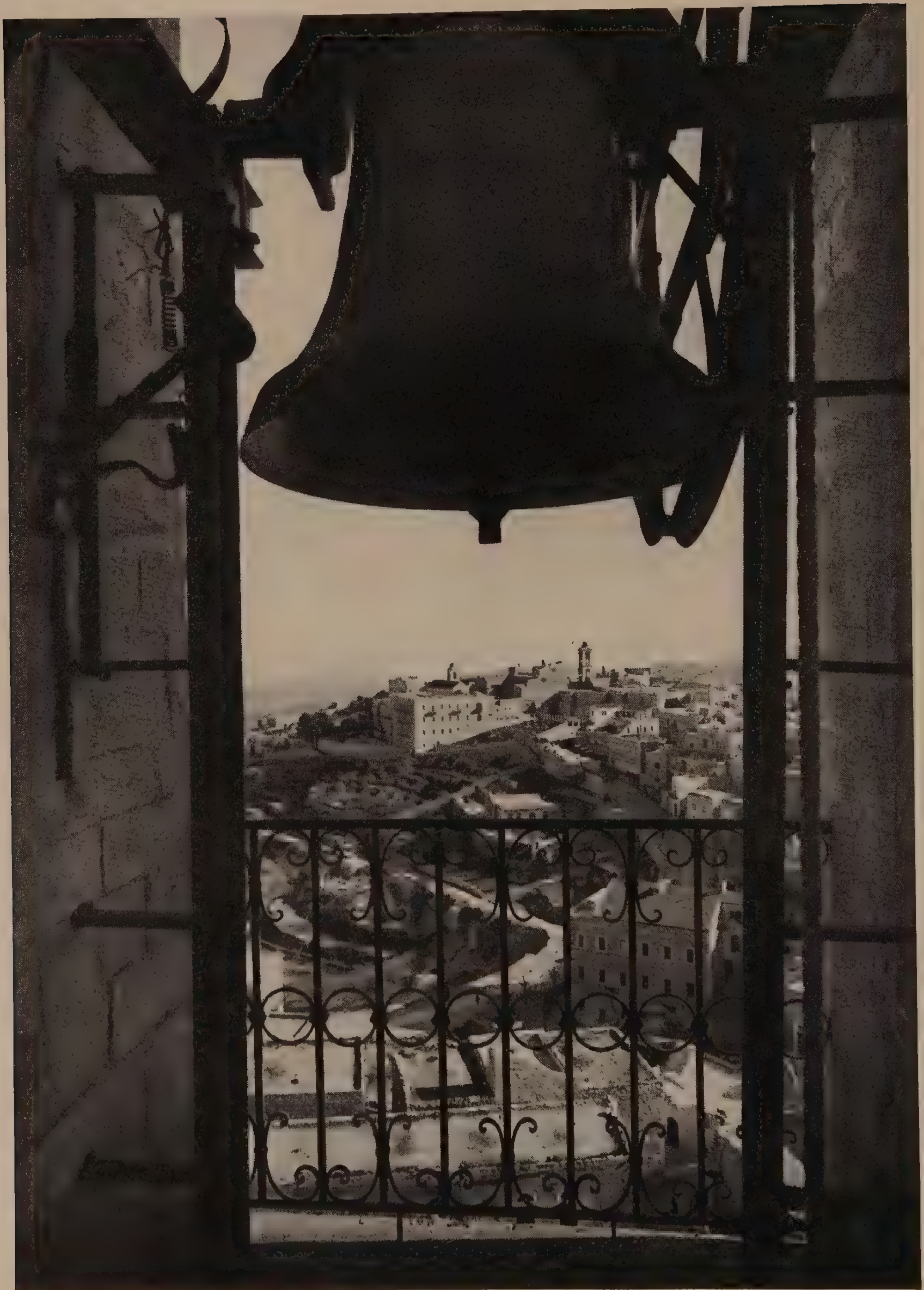
Afoot, we entered its wild Upper Valley, where ruinous castles, inaccessible as eagles' nests, crest precipitous rocks. The Black Forest's fringes began to enfold a slender Danube that rushed along in its youthful playtime, with no other care than to serve some lumber mill, where singing stream and screaming saw mingled their resonances under the dark pines.

For three nights of increasing cold we lodged at humble forest inns, where woodcutters drank schnapps and smoked huge drop-pipes around the great porcelain stove; and on the third night our host assured us that we were close to Donaueschingen, where the Fürstenberg spring joins the brook Brigach to form the Danube.

That last day was made memorable by an amateur blizzard and by walls of mist that closed blindingly about us. It wasn't until the close of daylight that we sleuthed a smell of cookery, which led us to a mist-emerging inn.

It turned out that we had overshot Donaueschingen and followed the Brigach for 20 miles. Exhausted, we fell asleep over our supper, reawakening just long enough to get to bed.

From beneath our window rose the shrill chant of the Brigach rushing down from the Sommerau. Our hodgepodge associations of Greeks and Romans, tugs and barges, Tatars and Crusaders, gypsy bands and cathedrals, became slumber-blended into one abiding theme. It was that of the Danube, pulsing onward into ever-widening vistas, blending Occident with Orient, sundering, yet uniting, peoples, in his ageless course from the Black Forest to the Black Sea.



GLAD TIDINGS RING OUT FROM HALLOWED SPIRES IN BETHLEHEM

A grilled opening in the chapel belfry of the boys' school, "The Father of the Orphan," makes a fitting frame for a view of the home of Christmas, with the two towers of the Church of the Nativity in the distance.

BETHLEHEM AND THE CHRISTMAS STORY

By John D. Whiting

Author of "From Jerusalem to Aleppo," "Village Life in the Holy Land," "Jerusalem's Locust Plague," "The Last Israelitish Sacrifice," "Among the Shepherds of Bethlehem," in the National Geographic Magazine

With Illustrations from Photographs by American Colony Photographers

WHEN I was a little boy, members of my family, recently returned from the Holy Land, were guests of friends in our home town in America. An elderly and much-loved mammy of the household in which we were visiting was brought in to see "the children that had just come from Jerusalem."

At the sight of us her dark face lit up. "De good Lord bless me," she said. "I thought Jerusalem was up in Heban."

So it is with Bethlehem. We all know of it as a small town in Judea and sing about it in our carols, but probably few realize how much it still contains that helps us to visualize the First Christmas. To those who know it well—its narrow, winding streets and lanes, cobblestone paved; its age-old homes, with walls of rough-cut stone grown mellow with years of sunshine; its vineyards, olive yards, and terraced gardens; and, most of all, its people and their Biblical customs—it still speaks vividly of the Nativity story.

The town, crowning a hill and dominating open valleys to the east and south, lies just far enough to the north of the busy road that links Jerusalem and Hebron to be undisturbed by congested traffic. With the exception of a handful of Moslem neighbors, its 6,000 hospitable inhabitants are all Christians and live together in amity.

BETHLEHEMITES ARE A THRIFTY PEOPLE

It is not to be supposed, however, because we find here a pervading spirit of peace, quiet, and friendliness, which to a great extent is missing in the larger neighboring cities, that the Bethlehemites are an indolent, easy-going people. Quite the contrary. It is not only the absence of political and religious animosities among them, but their thrifty industry that has brought on a state of well-being.

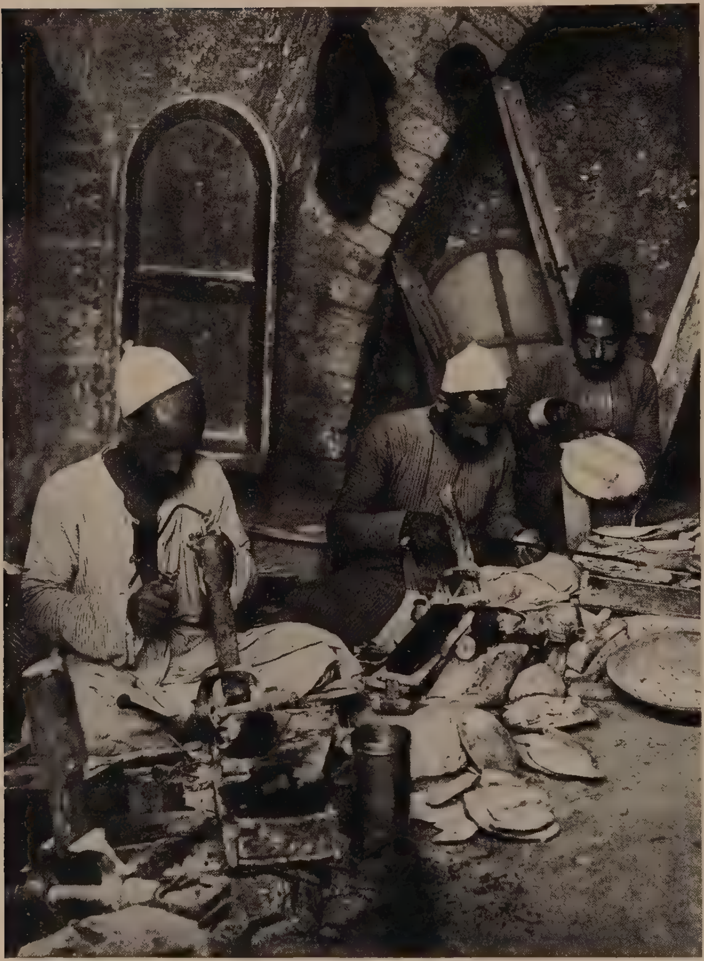
As we pass through the confined thoroughfares, now under a vaulted archway, now up by a steep flight of street steps, we may hear the hum and screech of tools carving pearl shell into ornaments or cutting thick sections of the same material into beads. The result may be a brooch, pendant, or necklet to bring joy to a lady upon the return of the pilgrim purchaser to some distant land. It may be an intricately carved and inlaid crucifix to hang, perhaps, on the wall of some small, lonely chapel; or it may be a snow-white rosary mounted with pure silver, destined to find its way into a convent.

These handicrafts, which, according to local standards, have brought at least a decent living, sometimes have been the avenues to modest wealth. Best of all, the industries have cultivated a sense of independence and self-respect in the natives.

The places of work are by no means sweatshops, although hours of labor are long and hard; nor do they savor of the factory. The shop consists of a room or two in the home or adjoining it. Sometimes only the members of a family work together; at other times a few outsiders are employed. Sitting cross-legged on the floor and working with the simplest tools and contraptions, the artisans turn out beautiful things; and, while the squeak of a saw or the rasping noise of many files cutting away at the hard shell is not a pleasant note, still, unless they have stopped to return in flowery Arabic the salutations of passers-by, the workers probably will be found passing otherwise irksome time in singing in unison tunes centuries old.

Going along a winding side alleyway in the Shepherds' Village one day, I came upon four damsels squatting on the floor of their room, inside a darkened doorway, busy with hand bows and drills. They were boring holes through pearl cubes which eventually would be finished into rounded beads.

One of the workers was a mother, though she was scarcely 18 years old. Swinging in front of her was a tiny hammock, and in it the bluest-eyed baby, smil-



BETHLEHEM HANDWORKERS FASHION UNIQUE PRODUCTS

The man at the left is making a lacelike fretwork medallion for a brooch or pendant. With bow and drill, the second bores holes in beads. The third craftsman has been carving Biblical pictures, probably copied from old artists. Da Vinci's "The Last Supper" is a favorite subject. The huge shells which provide the raw material of the shop formerly came exclusively from Red Sea and Persian Gulf pearl fisheries, but now many are obtained from Australia.

but locally as "Mecca fruit." These beads are dyed in vivid colors and made up into Moslem rosaries, on which the faithful repeat their prayers. Large numbers find their way through the markets of Arabia to Mecca and Medina.

SOME SEEK FORTUNE IN FOREIGN LANDS

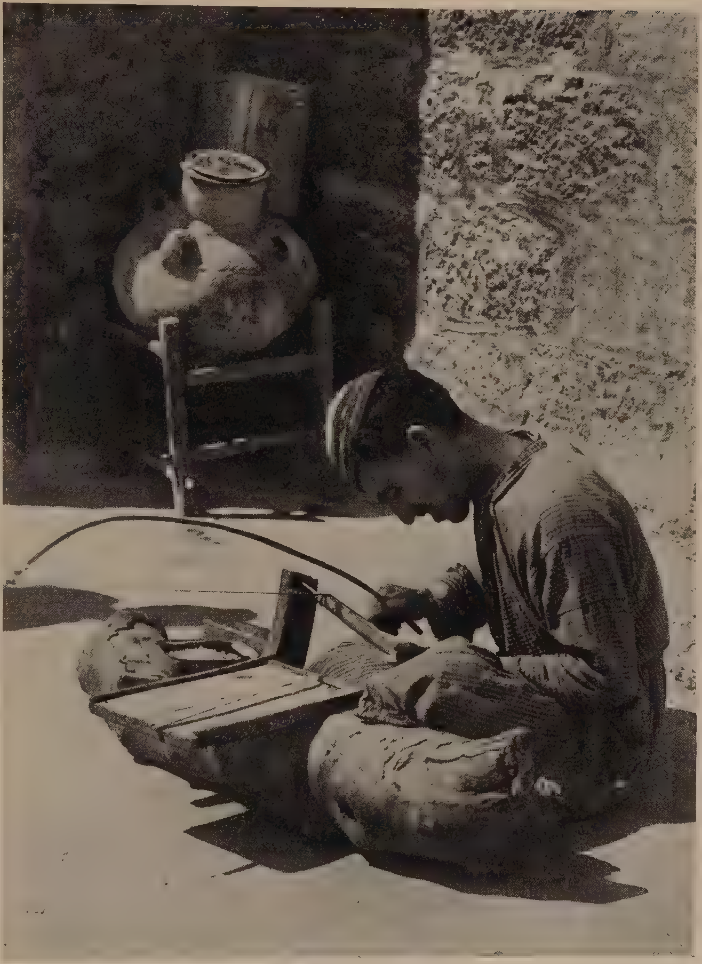
Not all the folk of Bethlehem are humble laborers. Many families are modestly well off. Their men have journeyed afar in their youth, mostly to the South American countries, and there have built up fortunes, beginning possibly as peddlers, then operating retail stores, and finally becoming wholesalers and supplying the newcomers from their native land. Prosperous as a result of their efforts in the countries of their temporary adoption, these merchant princes have returned to pass their declining years in the homes of their boyhood.

Many such successful adventurers began life in the Bethlehem pearl shops, saving a small amount from each thousand beads turned out. By dint of hard work and patience, they gathered enough for steerage tickets and, once abroad, they were helped along by their compatriots already established.

Others of them came from more pretentious families. Their fathers may have boasted of being "coffee and spice merchants," importers of commodities in the period before the countries around this end of the Mediterranean were opened to world commerce by steamer and railroad.

ing and happy. A miniature cookstove, upon which rested an ample pot, stood behind the mother, and she had time between borings for an occasional loving coo to the child, a gentle push to the swaying hammock, and an efficient stir to the pot with a large wooden spoon. The husband was a quarryman and would be hungry when he returned home.

A little way beyond this shop a solitary man sat under the dense shade of a fig tree, making beads from a palm seed known commercially as "vegetable ivory,"



BOW DRILLERS WORK WITH INCREDIBLE SPEED

A skilled artisan sometimes bores 3,000 beads in a day. The material used is mostly the gnarled thicker parts of shells formerly discarded as waste by New York pearl-button factories, but now shipped in enormous lots to Palestine. It is first soaked, then cut into strips, which are filed with coarse rasps into pencil-like sticks. Bits of these of the desired length are clamped in wooden vises and perforated as shown here.

Those were the days of the sail ship and the desert camel, when the merchant did not write or telegraph for his goods, but instead took long journeys, selected and bargained for his wares, and with them returned home by caravan.

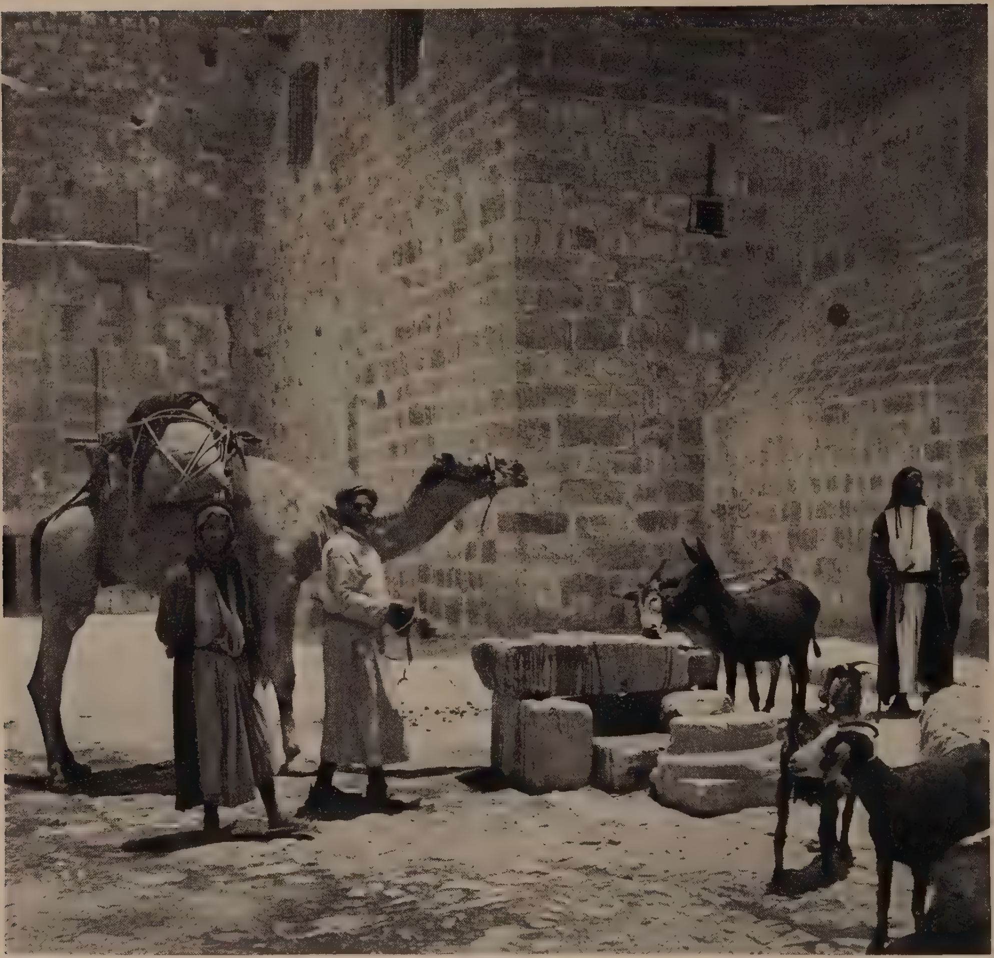
When about to start for a foreign land, Bethlehem youths still think much of *Ridda Waldain,* the parting blessing of their parents; they attribute their success to it. It reminds one often of the patriarchal blessings as recorded in Old Testament narratives. We read that when Rebekah had chosen to leave the land of her nativity and journey to be the wife of Isaac in Canaan, her mother and brethren blessed her and sent her away with the words, "Be thou the mother of thousands of millions" (Gen. XXIV: 60).

Again we see Jacob supplant his elder brother and receive the parental blessing, causing Esau in the agony of his soul to cry "with a great and exceeding bitter cry," and say unto his father, "Bless me, even me, also, O my father!" (Gen. XXVII: 34).

YOUTHS ARE COUNSELED TO COME HOME TO MARRY

Usually parents counsel their sons not to marry of the maidens of the land in which they sojourn, just as Abraham, in his declining days, while Isaac was still young, made his "eldest servant, that ruled over all he had, swear by the Lord," enjoining him, "Thou shalt not take a wife unto my son of the daughters of the Canaanites among whom I dwell; but thou shalt go unto my country, and to my kindred, and take a wife unto my son Isaac" (Gen. XXIV: 3, 4).

When the elder son has become firmly established in the foreign land in which he has sojourned, he sends for his younger brother, or perhaps a cousin, to join him. The newcomer, in a few years, usually takes the place of his superior and permits him to return home for a visit to his native Bethlehem.



CAMELS STILL COME LADEN TO THE PLACE WHERE JESUS WAS BORN

All the main streets of Bethlehem lead to the market square in front of the Church of the Nativity (see text, page 717). The tiny door at the extreme left is the entrance to the basilica. Above and at the side of the low opening can be seen the outlines of the original stately portal, long since walled up. Donkeys, much in use to pack light burdens, are drinking at the centuries-old rock trough at the cistern mouth. The milch goats have been brought here for sale.

Such a visit is the occasion for great rejoicing, particularly on the part of the proud mother. Merry are the songs that are sung on the road from the Jerusalem railroad station. To-day the visitor is whisked home in a modern car; yesterday, so to speak, he came in a carriage; before that he trudged home afoot or rode a saddle animal, a cavalcade of prancing horsemen and a procession of singing women accompanying him. But still the songs and rejoicing are just the same as in earlier days.

Sumptuous feasts are spread for any and all who will partake, long lines of friends come to make their salutations over a period of days or even weeks, and all the neighborhood is astir and happy. Careful attention to the conversations discloses that the boast of nearly all the guests is some relationship, friendship, or affiliation with the rich home-comer.

PREPARATIONS FOR A WEDDING ARE ELABORATE

Scarcely has the mirth and joy over the return subsided when a greater excitement is in store. The mother has carefully eyed

VAULTED PORCHES SERVE AS SEWING ROOMS

Bethlehem homes are built around open courts, and much needlework is done in the shady nooks just outside the doors. The mother and her three daughters are embroidering bridal or feast-day costumes for shopkeepers of the town, who furnish materials and pay the women for their labor.

for some time each eligible maiden and has selected one as a desirable wife for her son. The youth has agreed to his mother's choice, possibly even before seeing the bride elect; the girl and her parents are willing and a wedding is in prospect.

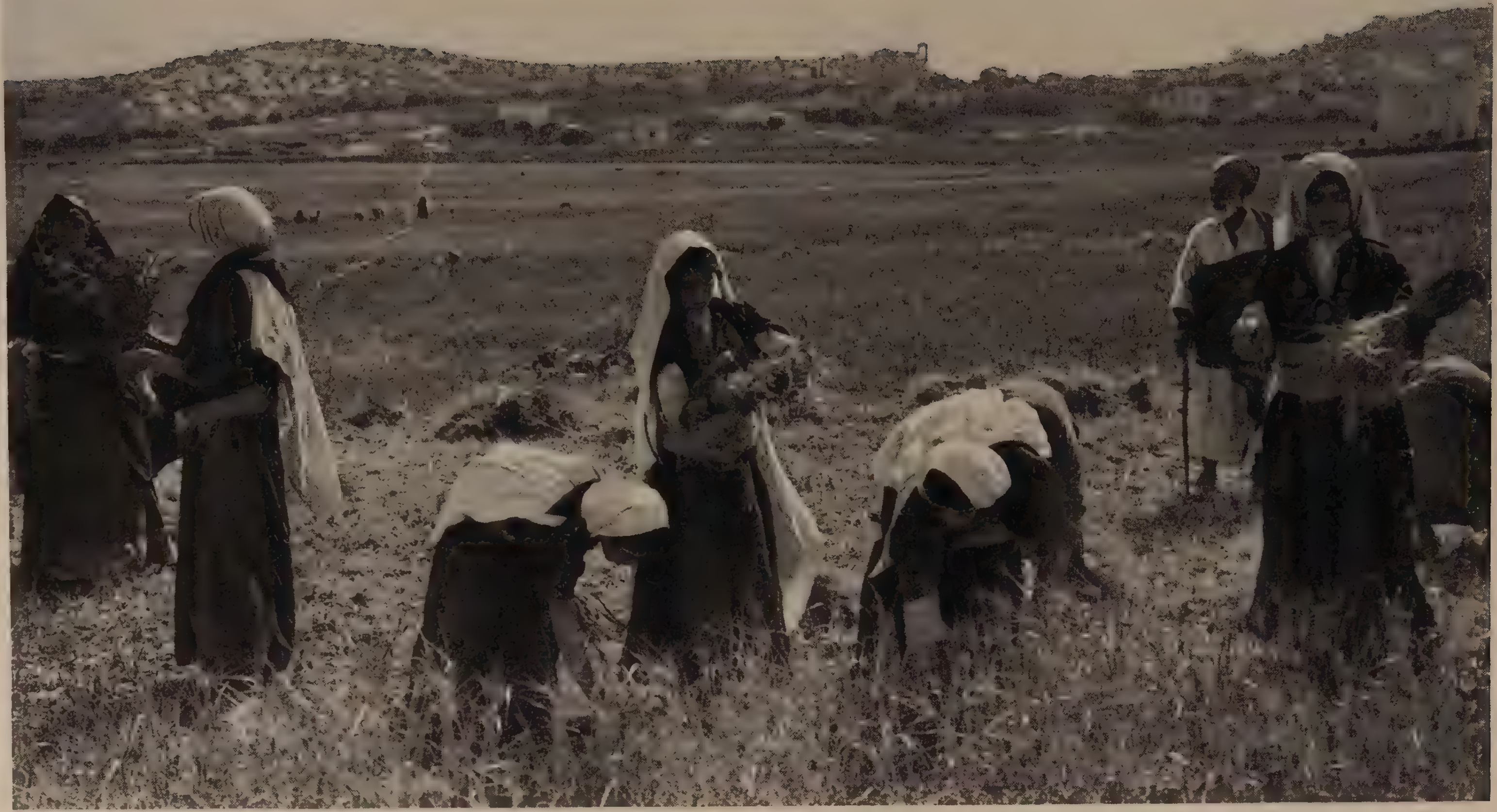
Of several Bethlehem weddings I have attended, one remains outstanding because of its uniqueness.

Years before the event, the four sons of a merchant had sought their fortunes in occidental lands, and now the third generation was stepping into the business. The eldest brother, a large, gray-bearded and kindly-eyed patriarch, had retired and returned to Bethlehem, where he was living in a new house surrounded by many members of the combined families. Upon the completion of the regal mansion his son came home from abroad to be married.

On the day set for the wedding many guests arrived, both natives and foreigners. Men, women, maidens, youths, children, mothers with swaddled babies—all were crowded together and carried along in a stream of overflowing happiness. The hosts and hostesses manifested their welcome by a flow of Arabic salutations remarkable for beauty of language and sincerity of purpose. There was a great deal

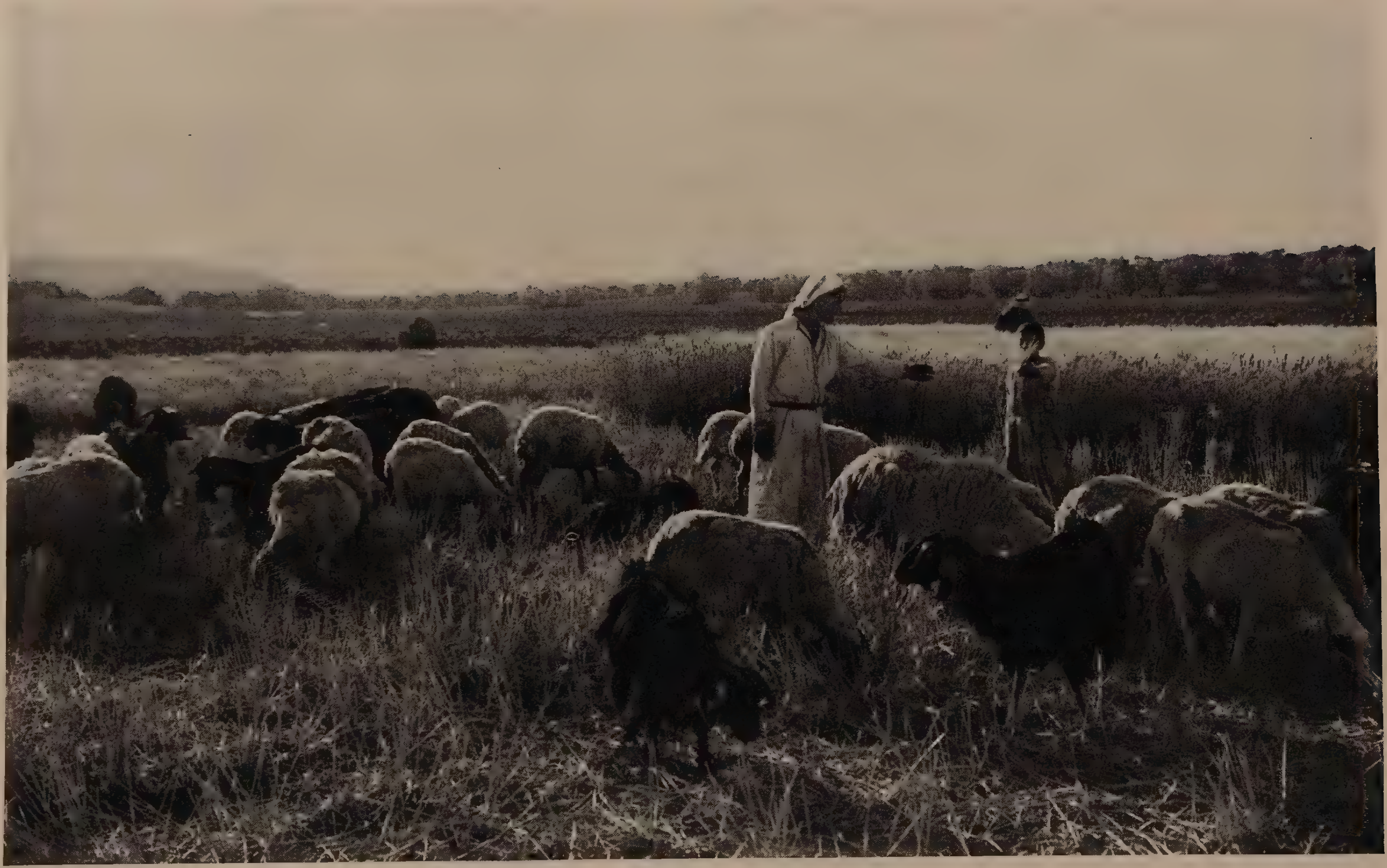
MOUNTAIN PATHS TO BETHLEHEM HAVE CHANGED LITTLE IN 2,000 YEARS

Although important highways of Palestine are now smooth, tarred roads for motor-truck and passenger-automobile traffic, there are still trails over which travel is possible only with camels or donkeys. This solitary rider has delivered his goods in Jerusalem and is returning home. His attire and equipment are probably almost identical with that of the Three Wise Men of old.



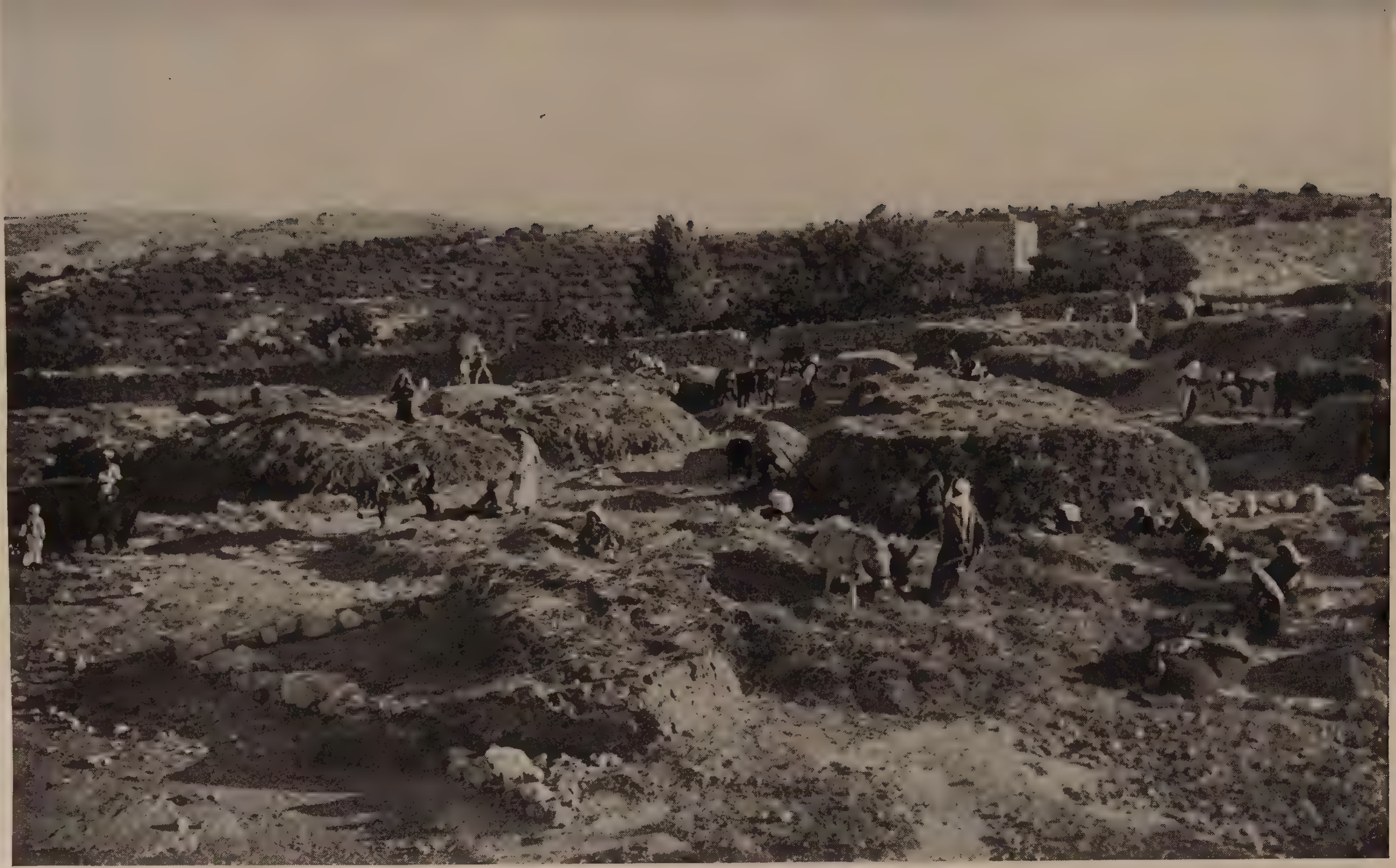
PRIMITIVE METHODS OF REAPING PREVAIL IN "THE HOUSE OF BREAD"

Wheat, called "corn" in the Bible, is gathered to-day just as it was in the days of Ruth (see text, page 725). The women workers, here presided over by a modern Boaz, wear just such capacious veils as that in which the Moabitess received six measures of grain as a gift from her employer. The village Beit Sahur lies in the background, and Bethlehem is hidden in the hills beyond.



FLOCKS GRAZE WHERE THE GRAIN HAS BEEN CUT

When reaping is done with the sickle, many ears of wheat are dropped. The owners of the fields follow the Biblical injunction and permit the poor to glean first. Sheep are then driven into the stubble to pick up what remains on the ground (see text, page 725).



BETHLEHEM THRESHING FLOORS HAVE RECEIVED THE HARVESTS OF AGES

When the sickles have been laid aside by the reapers and the loosened sheaves heaped on these surfaces of flat rock, every man's share in its separate pile, the grain is trampled out by shod mules and donkeys, or more often by oxen, each with eight small iron shoes nailed to its cloven hoofs. The method has remained unchanged since the days of Ruth and Boaz (see text, page 725).

of commotion and bustling preparation. An abundance of good things was urged upon everybody, as each new guest arrived.

This scene of hospitality recalled vividly to my mind the story of the home at Bethany, when "Martha was cumbered about much serving, and came to Him and said, 'Lord, dost Thou not care that my sister hath left me to serve alone? Bid her therefore that she help me'" (Luke x: 40). The hostesses, resplendent in their colorful attire of silk, broider work, and linen, were worn and tired like Martha, but happy after three days of cooking, feasting, and entertaining with music and dancing.

WESTERN AND EASTERN FASHIONS CLASH

Those of the hosts who had lived abroad donned for the occasion their Parisian black frock-coat suits; white shirts, ties, and gloves; and patent leather shoes. But even in such conventional attire East met West; each wore, indoors and out, a high red fez, or tarboosh, with swinging black tassel, and the bridegroom's father stroked his massive beard and nervously fumbled his amber beads.

The bridegroom was a handsome youth with a pleasing manner. The culture he had gained during his sojourns abroad was becomingly blended with the typical native reverence and submission to his parents and elders.

The bride, still in her teens, and wearing the costume of her people, made a picture befitting the brush of the best Madonna artists. Her *tobe,* or dress, was of the heaviest, handspun silk, red, with broad side stripes of green, the skirt widened with gores of scarlet, orange, and olive, and the bodice embroidered with silk and golden threads. She wore a folded cashmere girdle and over all a jacket of plush covered with colorful embroidery. Her face was encircled by a double fringe of gold coins surmounted by a white silk veil of ample proportions, and, as the sun's rays through the window caught the glitter of the precious metal, the reflection vividly suggested a halo.

Elsewhere in Palestine this fringe of coins about the virgin face gives way on marriage to more solid rows of dowry coins, but in Bethlehem and two adjacent villages the married woman dons a *shatweh,* or tall, pointed cap, worn under the veil, with the dowry gold sewn on the upstanding front.

A BRIDE IN WHITE VIOLATES NATIVE CUSTOM

As the hour of the church service arrived, the bride reappeared, wearing an imported dress of white satin and high-heeled slippers. Bedecked with the conventional orange blossoms and veil, she looked uncomfortably awkward. She walked arm in arm with the bridegroom, who likewise was clad in the latest of occidental styles. The bride had waited for her wedding day to discard her native costume, in which, quite unconsciously, she was stately and beautiful; the modes of the West were entirely foreign to all her surroundings and unfitted to her peculiar, erect, queenly bearing and determined stride.

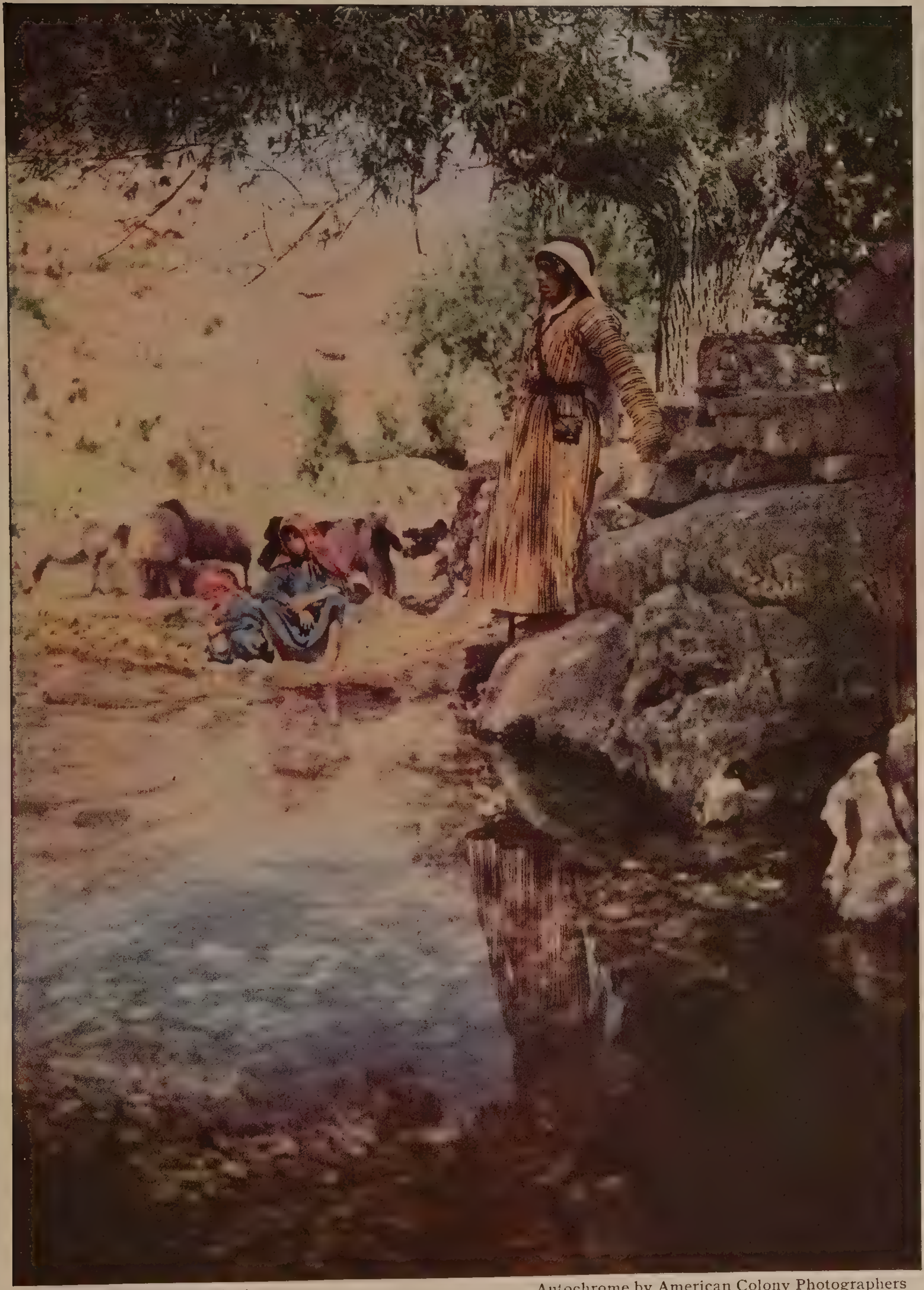
A bride in white is quite contrary to the native custom. When this girl's mother was married, artists in spinning, hand weaving, embroidery, and gold and silver smithing vied with one another to make her attire a riot of colors harmoniously blended into a thing of beauty befitting a country of sunshine.

Color has ever been the Eastern idea of beauty. In a parable, Jesus, speaking of the lilies, says: "Solomon in all his glory was not arrayed like one of these" (Matt. VI: 29). The Westerner has taken this to refer to the white lily as we know it. Not at all. What is meant by the lily is the anemone, a bulbous perennial that grows wild in Palestine, in great profusion of scarlet and purple, the royal colors of the Hebrews.

As the bridal train neared the old village, the party increased in number and its color and picturesqueness were enhanced. The men wore large turbans of vivid orange interwoven with threads of silver and gold. They were robed in flowing garments of striped silk girded with cashmere-shawl belts, and their outer cloaks were of seamless wool or camel's hair.

THE STRANGER IS MADE WELCOME

In Bethlehem no offense is taken if the uninvited choose to follow and take part in the joyous occasion; in fact, almost the contrary spirit is shown. The custom reminds one of the parable Jesus related of a king making a marriage feast for his



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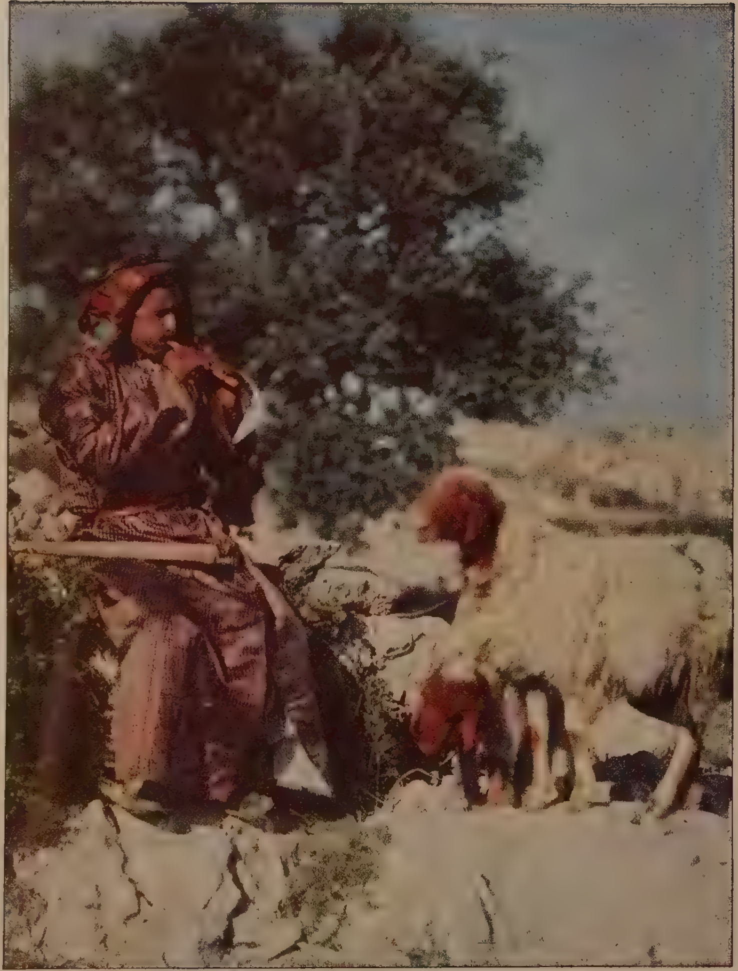
DESERT SHEPHERDS LEAD THEIR FLOCKS BESIDE STILL WATERS

Because for seven or eight hot months of each year in forestless Palestine not a drop of rain falls, Biblical writers in psalm, proverb, and legend extolled the virtues of cold and living water, fountains, and brooks, and described vividly the torture of thirst.



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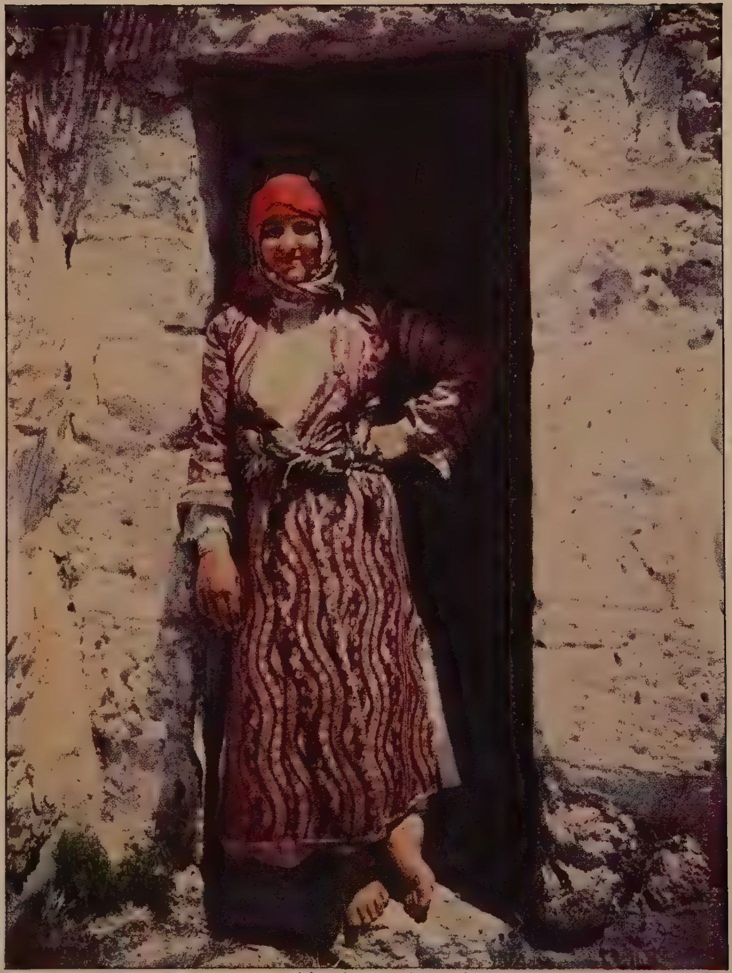
THUS YOUNG DAVID PIPED HIS SHEEP TO FOLD

Many of these quaint instruments, forerunners of modern church organs, are still made by Palestine shepherd boys from the reeds that grow about the fountains, though the better ones are fashioned from the bones of eagles' wings. The music is eery but strangely appealing, a



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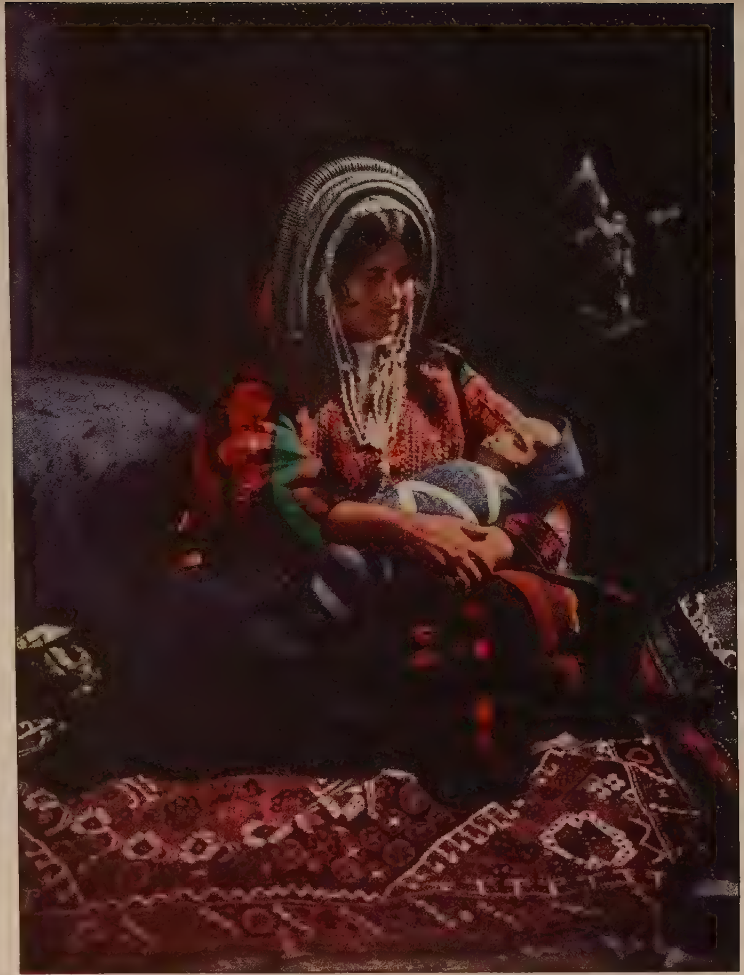
SHE IS CLAD LIKE THE LILIES OF THE FIELD

Handspun Tyrian purple and wrought gold braid make this girl's costume, a heritage from her grandmother, rival the colorful anemones of Palestine, the "lilies" of the Bible. Bobbed hair and short skirts have reached the cities, but in small towns such as Bethlehem and Nazareth,



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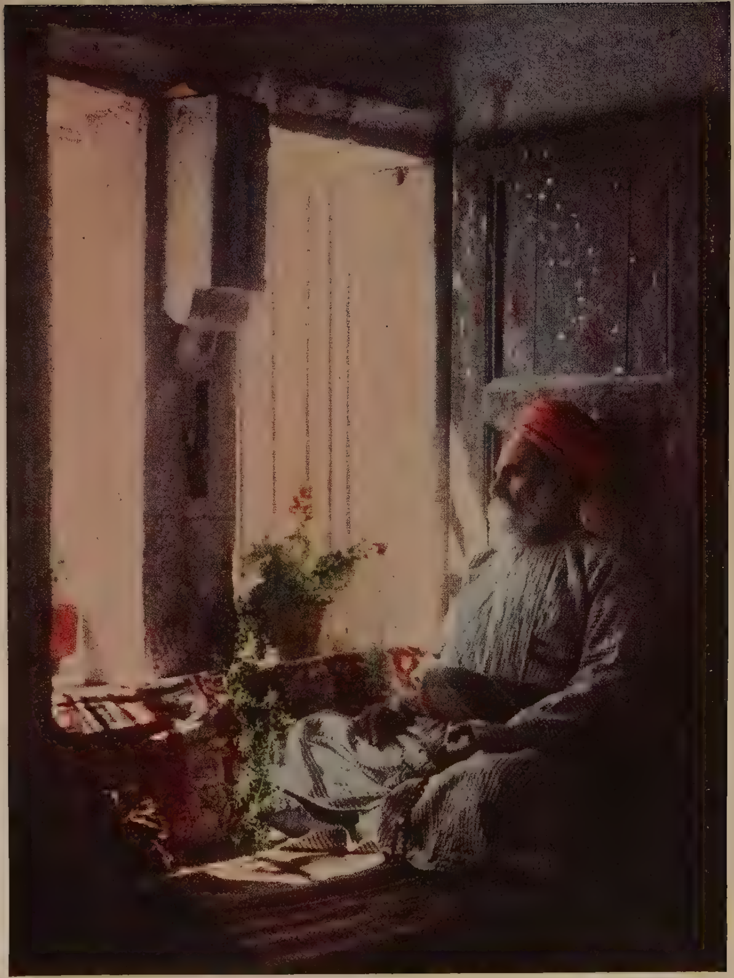
LIKE A HALO GLEAMS THE MOTHER'S HEADDRESS

Virgins of the village of Judea wear small rows of coins about their faces, which, at the time of marriage, give way to the heavier chaplet of the wedding dowry—possibly the origin of the golden circles surrounding the heads of subjects in early religious pictures.



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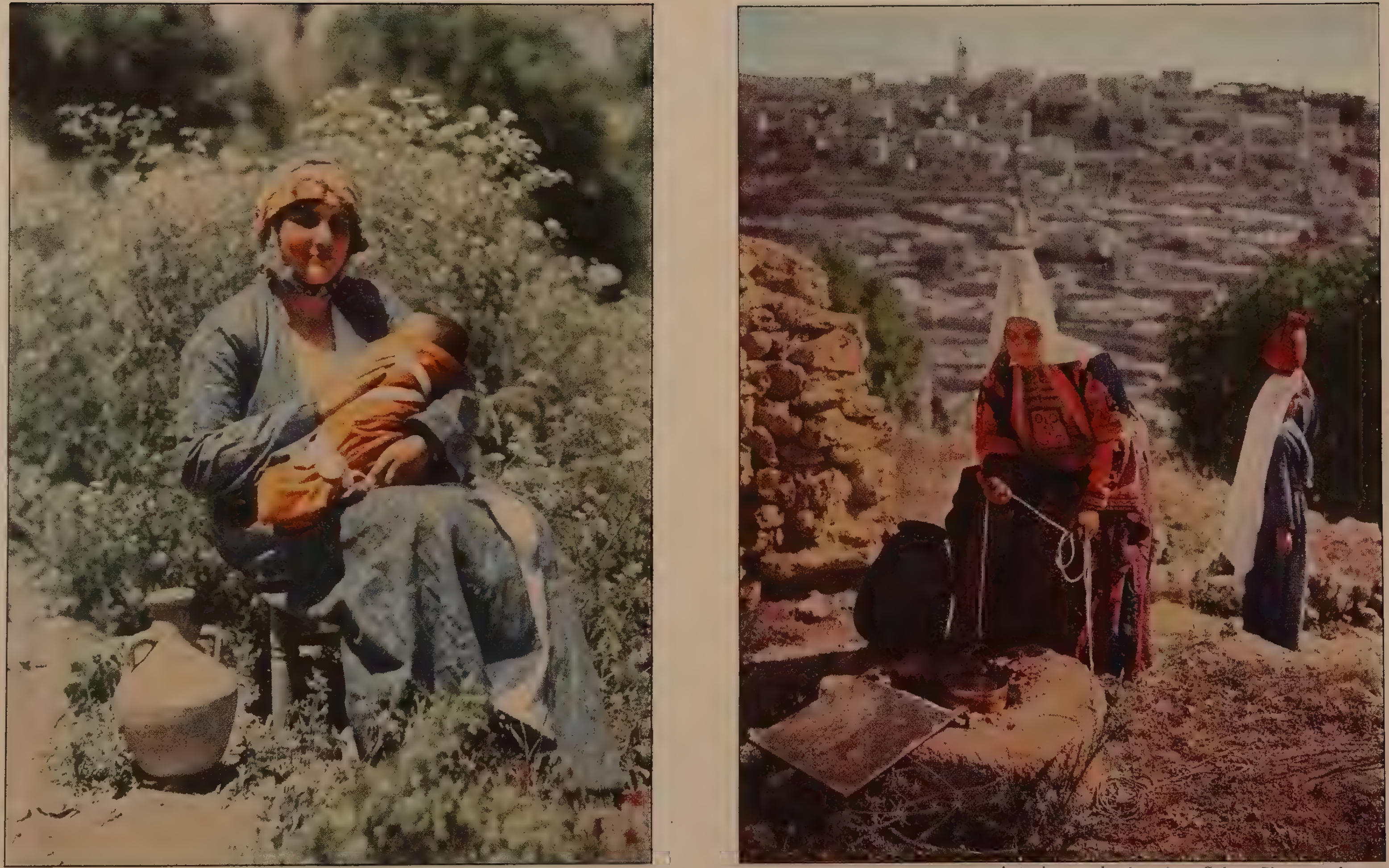
IN THE EAST AGE BRINGS RESPECT AND DEFERENCE

As Boaz sat in the gateway of Bethlehem and called upon passers-by to join him in discussing questions of the time, so this patriarch of to-day sits cross-legged on the window sill of his guest chamber, ready to receive those who come for advice and decision.



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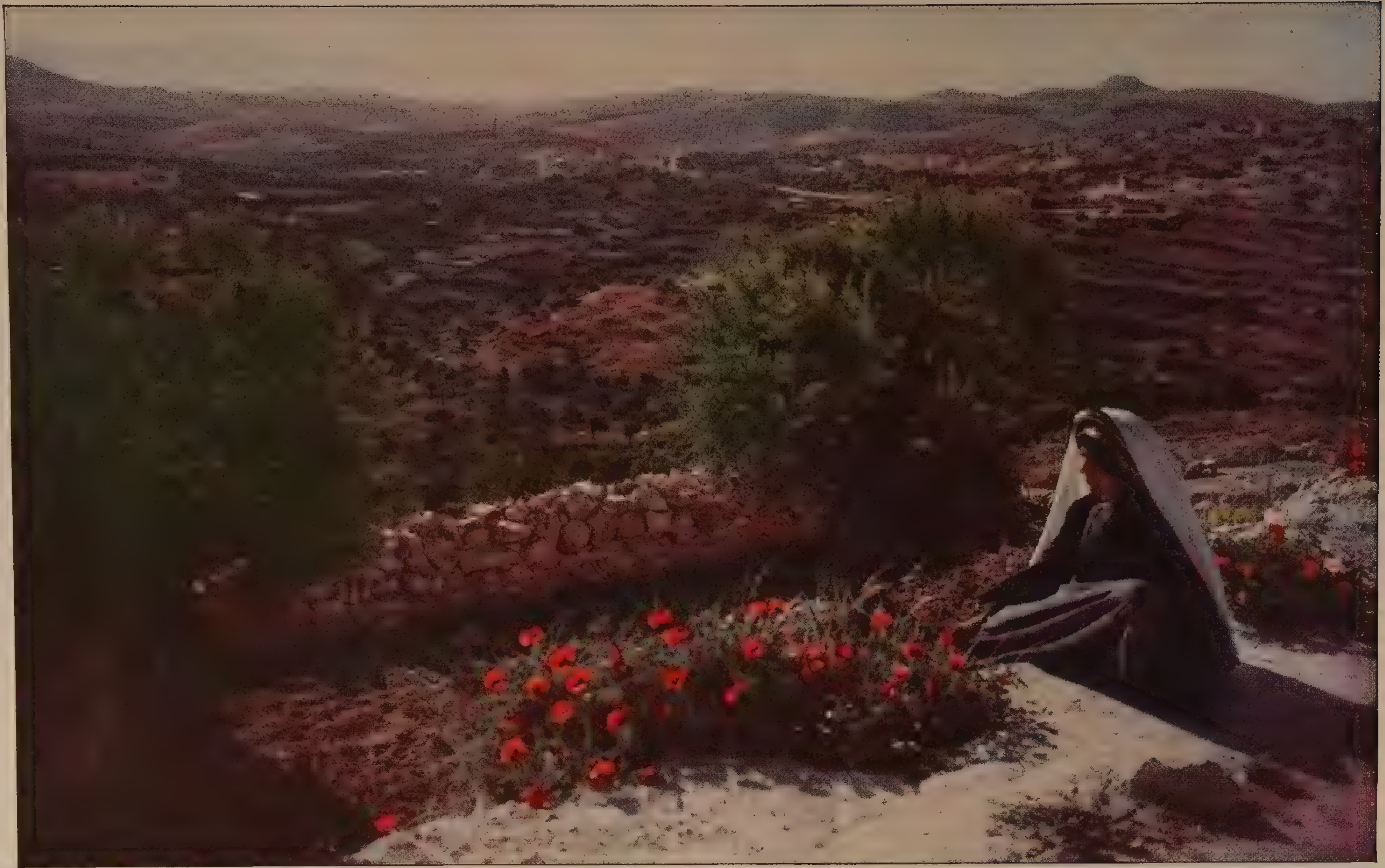
NATIVE COSTUMES WILL SOON BE ONLY A MEMORY IN PALESTINE

The young mother of the shepherd village with her infant wrapped like the Christ Child in swaddling clothes, the gorgeously appareled woman at the cistern of Bethlehem—both represent types that will die out with the present generation. The high cap and elaborate dress worn by the water drawer are of a style pictured on ancient pottery Astarti recently excavated at Jerusalem and centuries older than the Christmas story. Scholars formerly believed this fashion to be an importation by Frankish crusaders.



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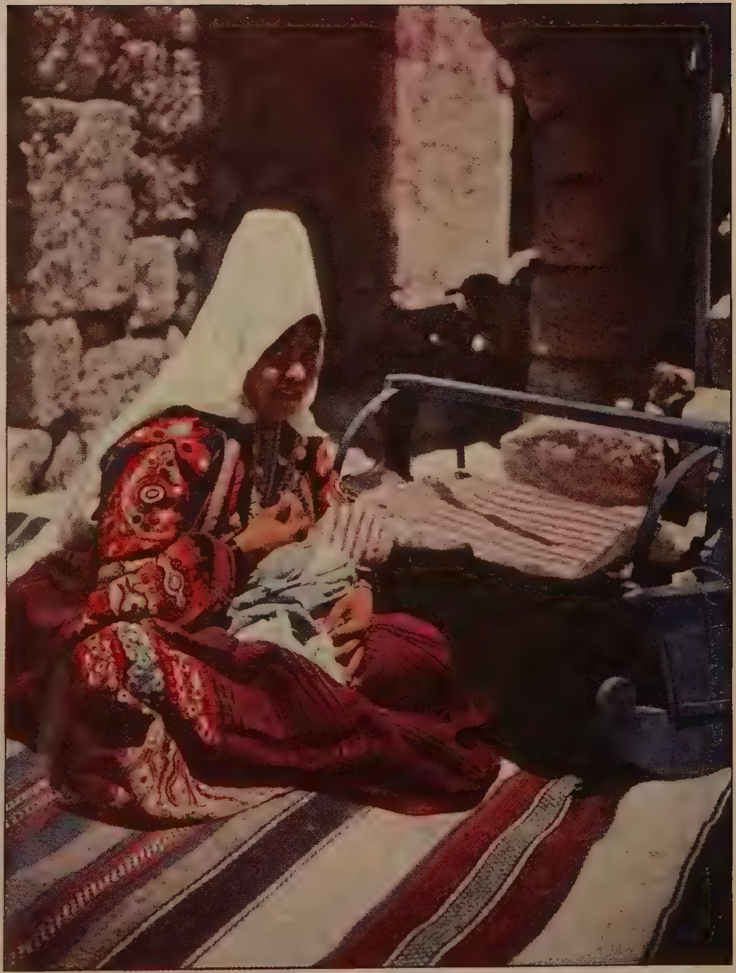
IN THE FIELDS BEYOND BETHLEHEM BOAZ REAPED AND RUTH GLEANED

Every available inch of mountainside has been terraced and planted. Here the olive, fig, and pomegranate thrive, and in the open valley below wheat and barley ripple in the sunlight. The hills in the background are the Range of Moab, and the cone-shaped peak is Herodium.



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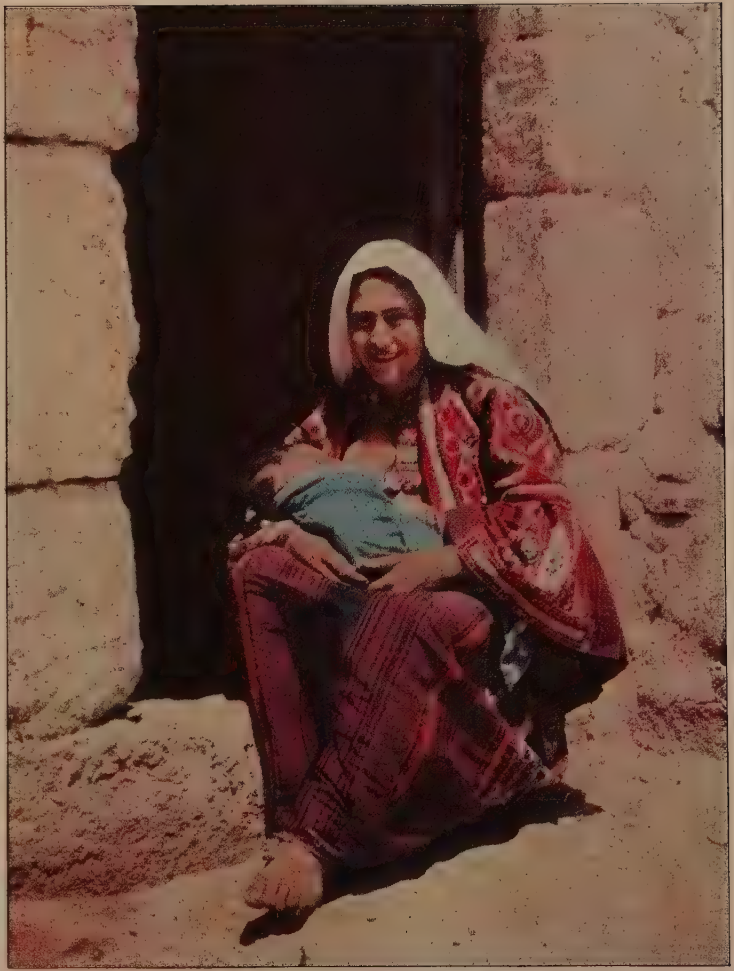
BETHLEHEM MOTHERS NURSE THEIR BABES

This young woman's costume is a triumph of spinning, hand-weaving, embroidery, and silver and gold smithing. A cradle or small hammock is always provided for the infant a few days after its birth. Its first bed is a low-sided market basket of straw or willow.



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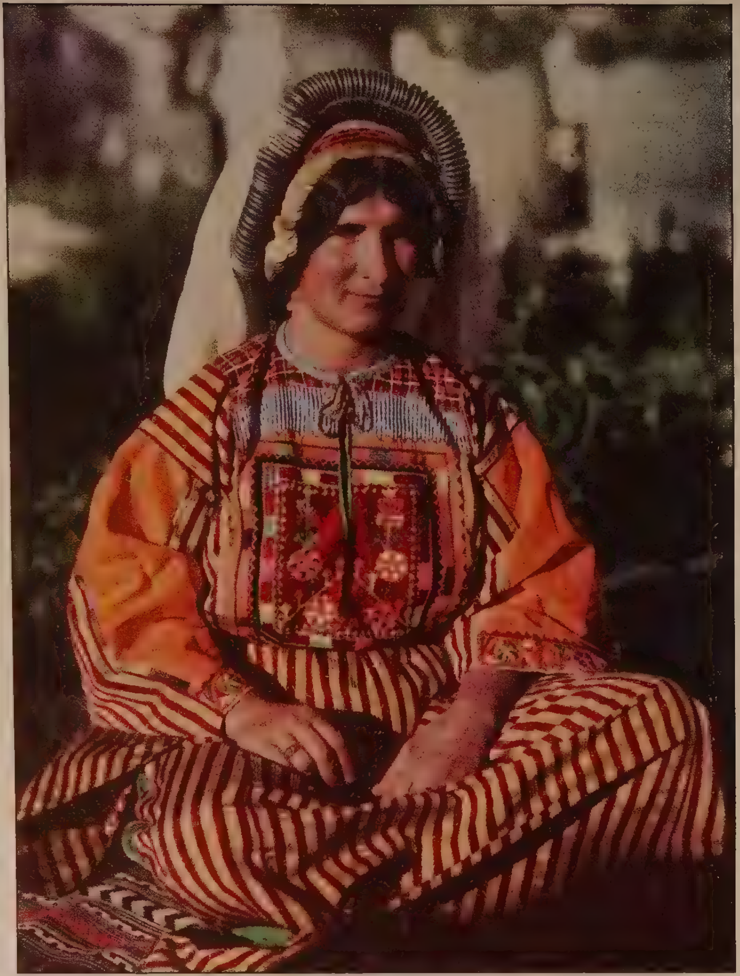
COMELY AND GENTLE IS THE VILLAGE MADONNA

From the tedious labor of boring pearl beads the little mother of the shepherd cot has come to sit for a while on her doorstep and lull her babe to sleep. She is scarcely 17 years old, yet she is versed in all the housewifely arts.



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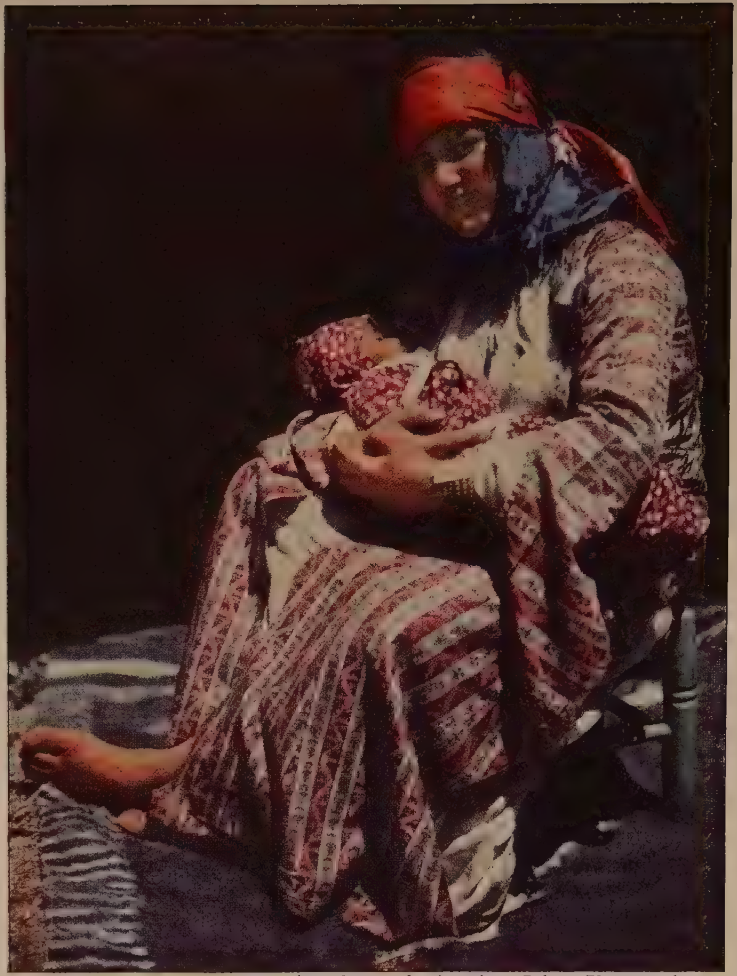
BRIDES CARRY THEIR DOWRIES ON THEIR HEADS

These wedding caps, loaded with silver and gold coins, often weigh so much that it is difficult to conceive how the women endure them. They are kept on day and night, because if they are removed for long their wearers suffer from headache (see also Color Plate III, left).



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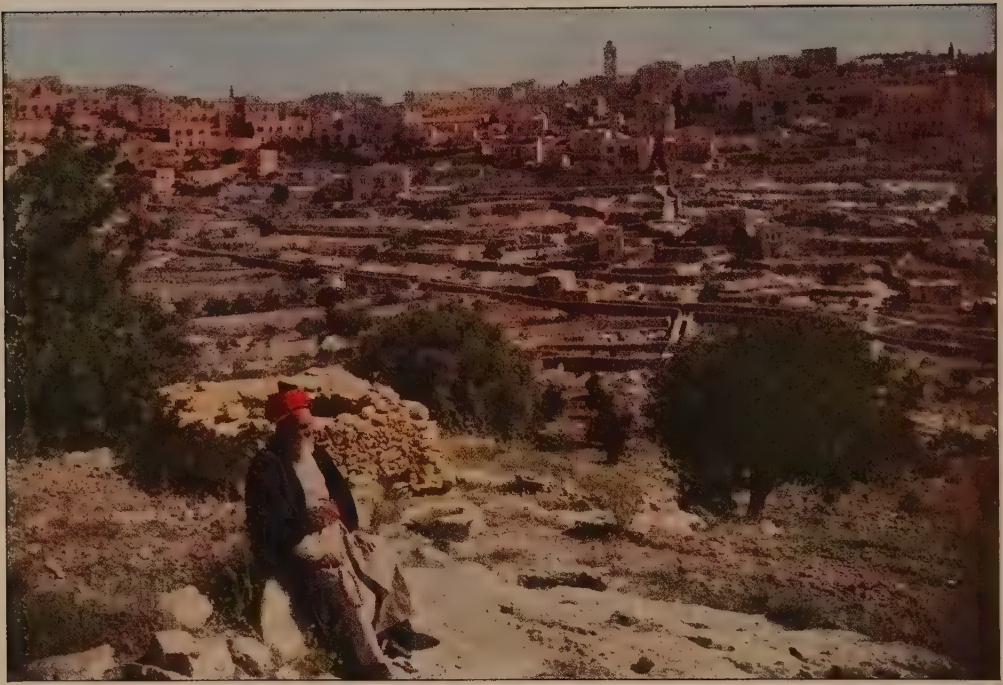
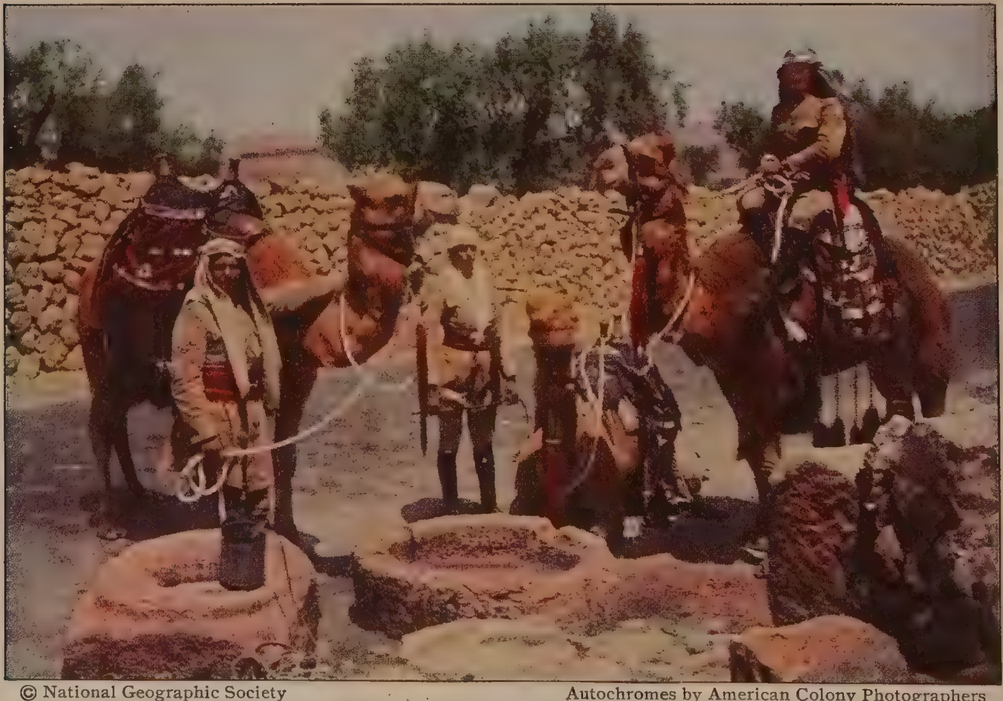
THE NAZARETH GIRL PRIZES HER MOTHER'S GOWN

This young woman's dress is a *fustan*, an heirloom reminiscent of an old-time wedding. It was woven in Damascus perhaps 100 years ago, of silver and gold thread. Garments of this type are rare, for most of them have been sold to jewelers for the precious metals they contain.



FROM THE SOUTH BETHLEHEM APPEARS IN UNSPOILED ANTIQUITY

Here is shown the oldest section of the town, dominated by the belfry of the Church of the Nativity, which thrusts up on the skyline. The view is unusual, for most visitors enter from the north or west.



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HERE THE THREE WISE MEN HALTED TO WATER THEIR CAMELS

Legend calls this cistern beside the road leading from the east to Bethlehem the Well of the Magi. In its crystal depths, it is believed, was mirrored the star that shone above the Christ Child's manger. The men with the dromedaries are members of the British desert border patrol.

son and saying to his servants, "Go ye therefore into the highways, and as many as ye shall find, bid to the marriage" (Matt. XXII: 9).

Crossing the village square, the procession made its way toward the Church of the Nativity, for to be married in this basilica is still considered a rare privilege. It is one of the oldest existing churches in Christendom, if not the oldest, one of the few used in common by the three Eastern denominations and revered by all sects of Christianity. The best authorities doubt not that it stands on or close to the site where Jesus was born and the place of the First Christmas.

Built A. D. 330 by the Emperor Constantine and added to by Justinian, it became in the fifth century the home of St. Jerome, who here translated the Old Testament from the Hebrew. Since that time it has gone through many vicissitudes and restorations.

From each street or alleyway more crowds poured out to get a glimpse of the bride or shower her and the party with attar of roses. All the main streets of Bethlehem lead to the market place fronting the church. Under this village square, the civic center of the town, are extensive rock-cut cisterns with stone troughs surrounding their openings; and the natives still lead their animals here at the noon hour and draw water for them, as they have done for centuries.

SIMPLICITY MARKS THE INTERIOR OF THE NATIVITY CHURCH

The present entrance to the Nativity Church is so small that in passing through it one must bend very low. It is closed by a heavily sheathed, iron-studded door. Since but one person could enter at a time, those of us who formed the rear guard had to wait outside. We used the time to examine the old façade. The original entrance must have been an imposing one, for over the present miniature door is a large portal that repeatedly through the ages has been made smaller (see page 702).

Stooping to enter, we came into an interior of great simplicity, where, between the two double rows of pinkish limestone monolith pillars, said to have been brought from the ruins of the Temple of Jerusalem, the priest with swinging silver incense-burners met the bride and bridegroom. Above the supporting columns we saw the old wooden roof, the gift of Edward the Fourth and Philip of Burgundy. About the walls, scattered patches of gold and colored Byzantine mosaics, contrasting with the white plaster that was filled in as portions of the mosaics dropped off, caught our attention. Particularly interesting was a fragment depicting a row of half figures intended to be portraits of the ancestry of Joseph.

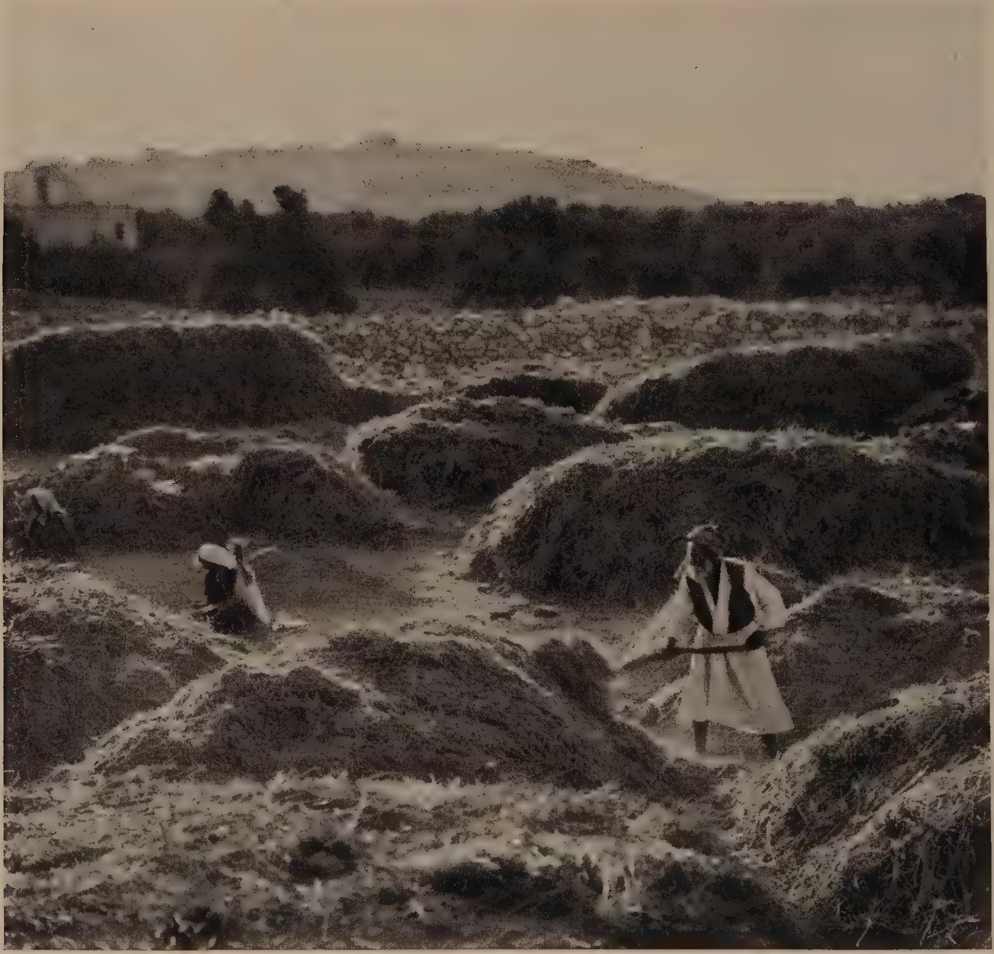
A pretty story is still told by the Bethlehemites, which, though it lacks historic backing, may account for the sparing of this church when the hordes of the ruthless Persian Chosroes burned and destroyed all the other churches in Palestine, including the Church of the Holy Sepulcher in Jerusalem.

It is said that among the earliest mosaics over the main entrance within was a large panel representing the Magi making rich offerings to the Infant Jesus. Seeing this, and recognizing by the costumes that the Three Wise Men were Persians, the vandal hordes spared the church.

Beyond the nave through which we entered we saw the elevated transept, and in front a high altar separated from the choir by a carved and gilded screen. To this altar the bridal pair had been led. Below the transept a chamber, part cave, part masonry, was pointed out to us as the birthplace of Jesus. A silver star attached to the flagstones of the floor in this crypt marks the spot where supposedly the birth took place, and across the room is an altar where the manger cradle is thought to have stood. Such semicave dwellings are still in daily use in Bethlehem (see page 719).

The smallness of the church door had so delayed the entrance that when the last of the procession had managed to pass through, the marriage service was almost at an end. Mumbled in classic Arabic, the words of the priest were intelligible to very few of the guests.

The service throughout lacked the drilled precision of an American wedding. Disturbing noises were the footsteps of those still coming in, the bustle of others carrying the burden of affairs, the merry voices of children, and the whispers of the elders.



WINNOWING IS A TASK FOR THE MASTER OF THE HARVEST

At the close of day, when the laborers have gone to their homes in the village, or in the early morning, before they have returned to the fields, the owner may be found at the threshing floor tossing the trodden sheaves with a simple wooden fork, in order that the wind may separate the chaff from the grain. The woman at the left is a member of the household. She is either loosening the heaps of wheat for the next day or gathering straw for basketwork.

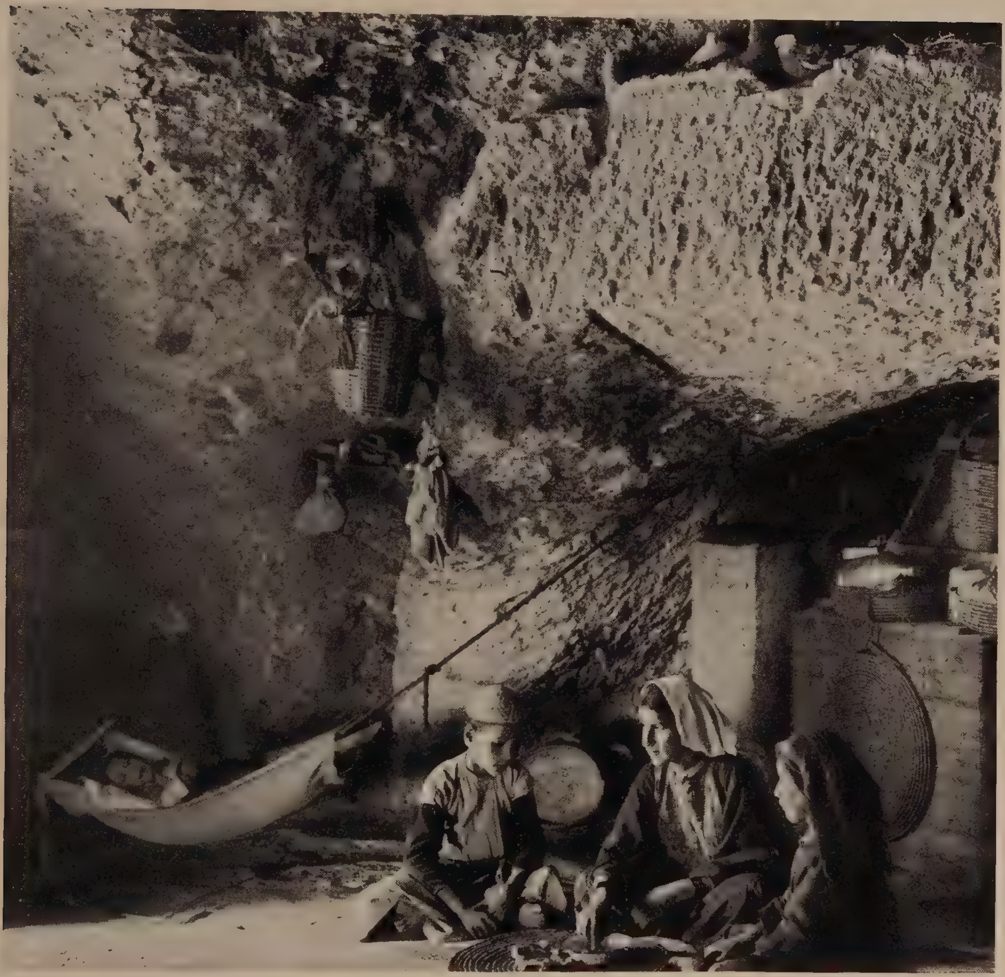
Nevertheless a sense of solemnity and deep reverence pervaded this house of prayer.

Each patriarch removed his great turbaned headgear, revealing a white skullcap, while all the young men stood bareheaded. The women, following the letter of the Apostle Paul's injunction, scrupulously secreted every lock of hair beneath the cover veil (1 Cor. XI: 13).

Through the lofty windows, into the subdued light of the interior, poured shafts of the sun's rays, as if with intent to gladden and brighten the already gorgeously clad and happy assemblage and to rival the flicker of scores of tapers carried in the procession (see page 720).

BETHLEHEMITES ARE DESCENDANTS OF CRUSADERS

This marriage scene brought vividly to mind one of historic importance that took place here when, on Christmas Day, A. D. 1100, Baldwin I was crowned king of Jerusalem. The Bethlehemites lay claim to being descendants of the Crusaders. The fair skin, the blue eyes, the rosy cheeks, noticeably among the maidens of



JESUS WAS BORN IN A HOME LIKE THIS

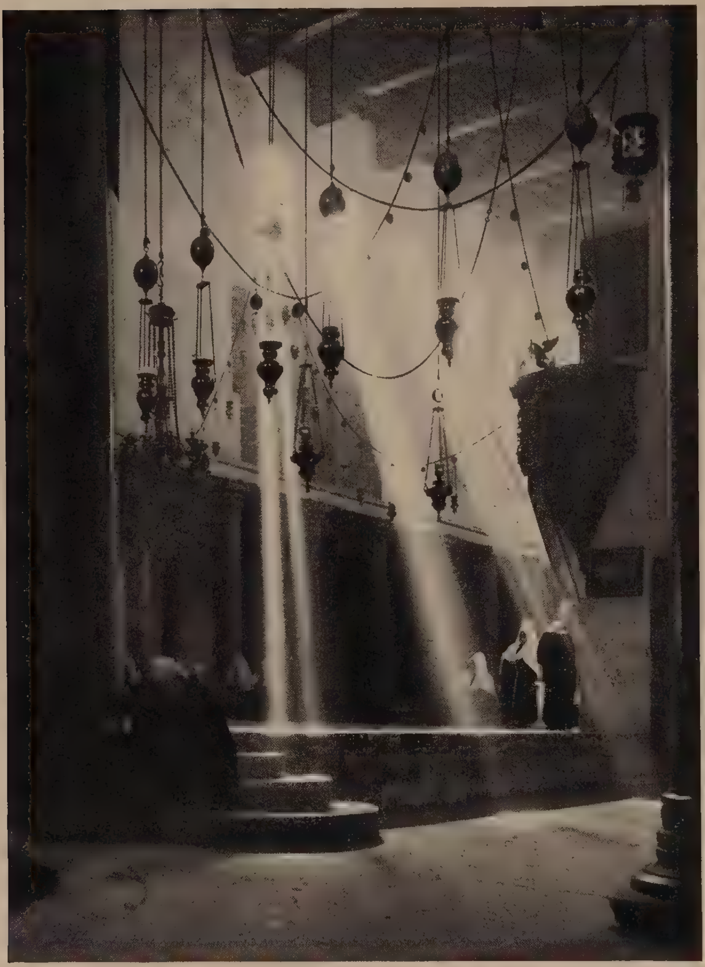
Built against the side of the mountain, the house is part masonry, part cave hewn into the soft rock (see text, page 727). The three children are eating a frugal meal, dipping morsels of bread into a common bowl, while their baby brother or sister sleeps in the low hammock near them and doves coo in the crannied wall above. Beyond the raised floor upon which they sit is the stable with its stone mangers (see, also, text, page 730).

the higher classes, seem to substantiate this assertion.

When the bridal pair reached home and were about to set foot into the domed entrance hall, there burst out suddenly a roar of firearms which startled the foreign guests, but greatly delighted the natives. The bridegroom's father and three brothers had drawn six-shooters from their hip pockets and emptied the barrels into the ceiling. Piercing the plaster and lodging in the stone arch, the bullets left deep scars in the frescoes as lasting mementoes of happy days.

This shooting is reminiscent of a Bedouin and possibly a primitive-man custom. In the old days, when an enemy camp had been raided and a bride captured, or, more often, when a bride was brought safely from her father's tent through enemy country, triumphant volleys were fired to celebrate the driving away of the pursuers.

At the home the entertainment continued with much mirth, and dancing of a sort strange to occidental eyes. The mother, sisters, and other relatives danced solos before the bridal pair. These num-



GOLDEN SUNLIGHT GLORIFIES ONE OF THE OLDEST CHURCHES IN CHRISTENDOM

Women are praying on the raised platform over the Grotto of the Nativity, where the wedding described by the author on page 717 was solemnized. Silver lamps hang from the ceiling. The globular objects below which swing the bowls of burning olive oil are ostrich eggs, either natural and metal-mounted or made of faïence decorated with crosses and cupids in colors. These ornaments prevent mice from running down the chains and getting into the oil, and also remind worshipers to attend the sermon as vigilantly as the ostrich is believed to watch its nest.

bers were varied occasionally by a man and woman dancing in unison but apart, the movement being not so much a step as a rhythm of the body and arms, depicting in perfect harmony and time sword-wielding and other warlike gestures, survivals of days of chivalry, when self-protection was the only law of the land.

Accompanying the dancing, the singing women would call out their shrill warbling notes, hard to explain and harder to produce by any but the initiated; then into the tune they would sing words composed impromptu, extolling the virtues of the bride and magnifying the manly characteristics of the bridegroom. The scene reminded one of the reception of David when he was returning from the slaughter of the Philistines, and the women came out singing and dancing and said, "Saul hath slain his thousands and David his ten thousands" (I Sam. XVIII: 6, 7).

The wedding party disbanded that night, but only after the last flicker of human energy had been expended.

A PILGRIMAGE TO BETHLEHEM

To-day the pilgrims and visitors, as well as the natives, enjoy a quick run from Jerusalem to Bethlehem over a smooth, dustless road in modern cars; still it is pleasant, in thinking of the First Christmas, to let memory carry one back, as I can, to days when there were no vehicles of any kind to mar an ancient setting, when camel and donkey trails and footpaths were the only highways.

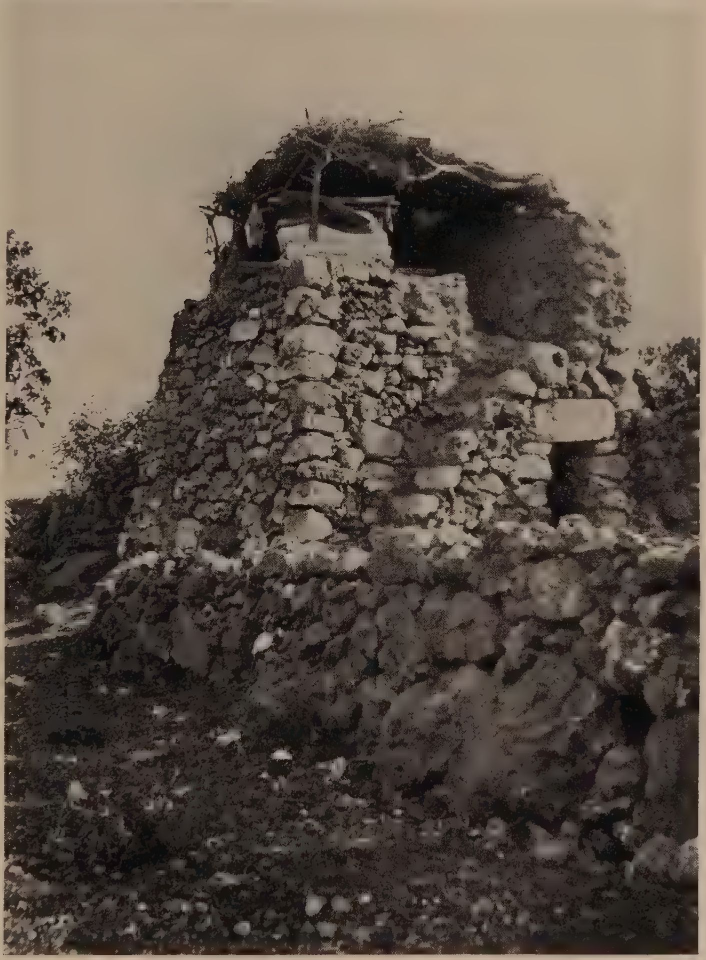
Leaving Jerusalem, with its encircling wall, towers, and bulwarks behind, the traveler crosses the plain of Rephaim and starts a gradual ascent. From the top of this hill he catches his first glimpse of Bethlehem, called *Beit Lahm,* "The House of Bread," by the ancients because of the fertility of its fields.

By the roadside at the foot of the hill is a large old cistern with twin openings from which to draw water. One of these openings is topped by a section of conduit built by the Roman Procurator, Pontius Pilate, to supply Jerusalem with water.* Between the cistern tops is a circular stone trough. One can scarcely pass during the noontide hours of a hot summer day without finding many flocks being watered at this well, and sometimes long strings of camels stop here to quench their thirst.

While this cistern has no historic background, a pretty legend hangs to it. It is known as the "Well of the Magi." Supposedly the Three Wise Men halted here to water their camels on the night when they were on their way to Bethlehem, seeking "Him who is born King of the Jews" (Matt. II: 2).

They were weary and worn, and Herod's injunction to let him know when they discovered the Christ Child was troubling them. They knew not how near they were to their goal, for Bethlehem was hidden from them by the little hill beyond. Leaning over the well's mouth to draw water, they saw to their delight the reflection of the star which they had seen in the East and which now was to lead them to the manger cradle.

The swift *hajin,* or riding camels, such as the Magi are usually pictured riding, are now rarely seen in these parts, for they are the desert mounts. Far out on the eastern boundaries of this mandated territory, where the desert meets Moab, the British have a strong and well-equipped camel corps. It was my good fortune, while I was wandering about one day on the way to Bethlehem, to obtain a picture of three men of the East watering their camels at this old well (see Color Plate VIII). Though their attire is somewhat



EVERY VINEYARD HAS ITS WATCHTOWER

During the heat of the day the members of the family live in the lower room, where the provisions are stored, and a solitary watcher, often a woman or child, keeps lookout in the bower-covered arbor atop the structure. At night the upper floor serves as sleeping quarters for all save the father, who makes occasional rounds of his property to drive away foxes or other marauders. Such rude buildings of field stones are the summer homes of the Bethlehemites (see text, page 730).

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* See "An Old Jewel in the Proper Setting," by Charles W. Whitehair, in the NATIONAL GEOGRAPHIC MAGAZINE for October, 1918.

THOUSANDS OF YEARS OF USAGE HAVE WORN THIS MOUNTAIN TRAIL

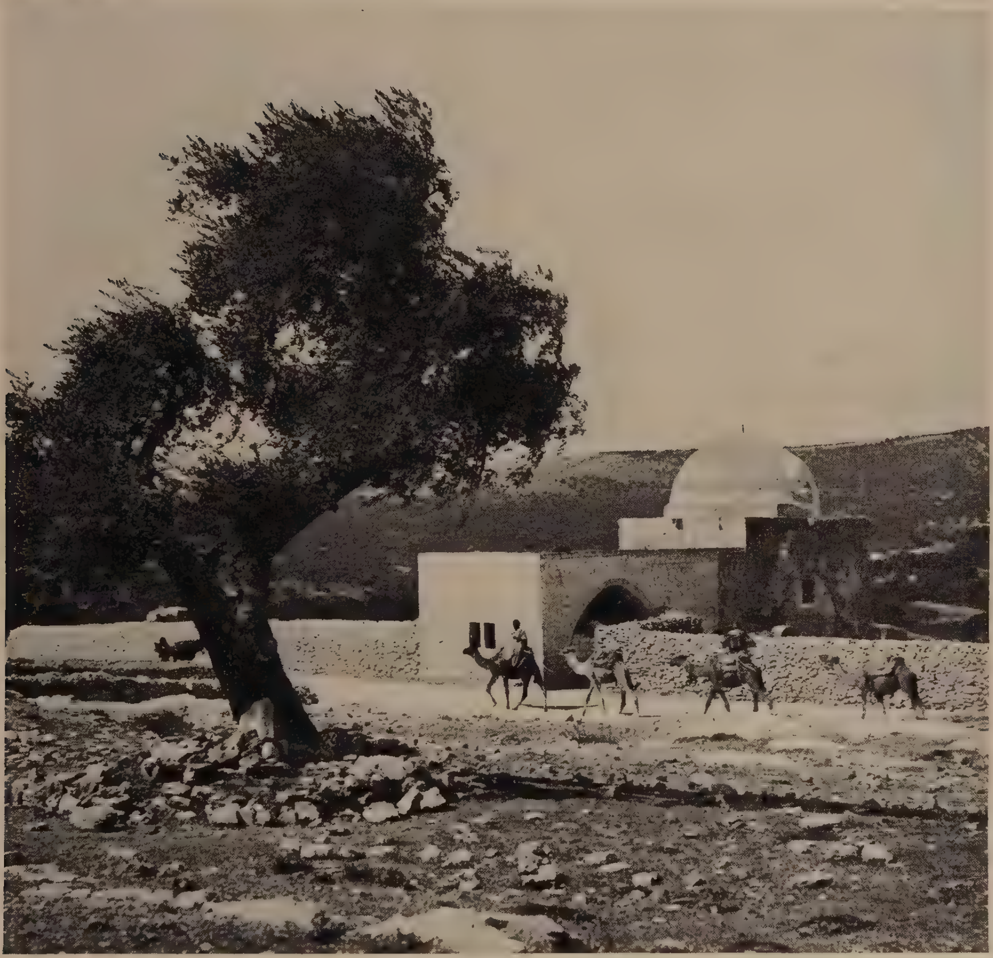
Over the very road by which the two women are climbing toward Bethlehem, the shepherds of the First Christmas made their way in search of the Manger Child. It is the custom of carrying water jars and other heavy burdens balanced on the head that gives girls of Palestine their stately bearing.

modern and they may have no claim to special wisdom, they reminded me of the "Three Wise Men of the East" (Matt. II: I) and of the First Christmas.

The hill drops away rather abruptly, once one tops the ascent, and Bethlehem, perched in a unique position geographically, bursts into view. To the east is an open valley, a huge amphitheater in the mountains. Into this the hill of Bethlehem thrusts itself, towering above the valley on the north, east, and south. On the west, although connected with the adjoining country, it lifts its crown above the surrounding hills and mountain tops.

Every inch of these steep sides is cut with terraces, many only wide enough to admit of planting a single row of trees, with perhaps a few grapevines hanging over the terrace walls. Olives, figs, pomegranates, and grapes cover these slopes, and at the base nestles the Shepherds' Village, a sort of farming outpost of Bethlehem.

To the east of this village opens up the fertile farm land in the valley bottom. As harvest time nears, it is a veritable patchwork of color, with wheat still a rich, deep green; barley a lighter green, with the yellowish tinge setting in; lentils,



MOSLEM, JEW, AND CHRISTIAN REVERE THE SPOT WHERE RACHEL IS BURIED

About this tomb, beside the road that connects Jerusalem with Bethlehem and the more distant Hebron, lies a Mohammedan cemetery, but the keys to the sanctuary are kept by the Hebrews. Here worshipers of three religions come to pray. The hills of Judah are seen in the background (see text, page 725).

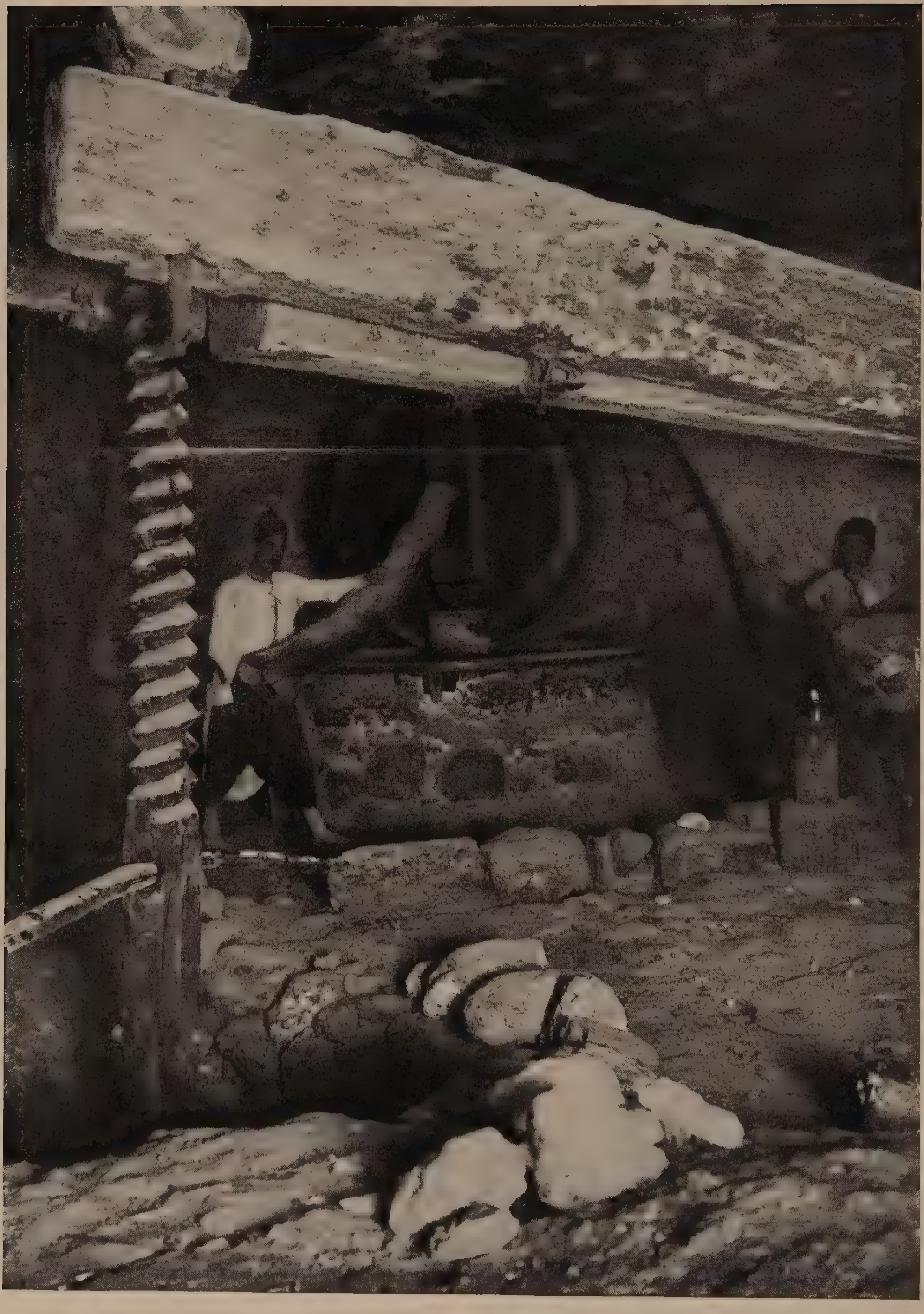
spelts, and pulse turning into many shades of tan and yellow, as the time of their gathering approaches.

Seen from above Bethlehem, these fertile fields blend with the Desert of Judea, the Desert of the Scapegoat, described in Leviticus XVI: 8, 9, 10. The great expanse of arid waste drops abruptly into the Dead Sea, but the waters, 1,300 feet below sea level, are mostly hidden from view by hillocks and mountain ranges rising above its precipitous shore.

Beyond this salt lake to the north is the Jordan Valley, the course of the river outlined by a fringe of green, the green of tamarisk and poplar. The limit of the view eastward is the irregular Range of Moab, blue and seemingly transparent as a sapphire in the setting sun (see Color Plate V).

HISTORIC SITES ABOUND NEAR BETHLEHEM

All about cluster numerous historical sites, where important scenes of the past were enacted, and the history, interlocking, seems to lead up to and culminate in the First Christmas. It seems fitting to consider these places in the chronological order of the events with which they are associated.



IN A DARK ROCK CAVE AN ANCIENT OLIVE PRESS STILL FUNCTIONS

To the beam behind which the youth stands, a mule or camel is hitched when the millstone is to be rotated. The hand-hewn screw at the left, turned by the lever thrust into its base, lets down the weight of the enormous oaken beam to squeeze the oil out of the crushed fruit. The flickering lamp on the stone stand in front of the boy at the right furnishes the only illumination (see text, page 727).

Where the road to Bethlehem forks off to Hebron, there stands by the wayside a picturesque little dome, the unpretentious tomb of Rachel, favorite wife of Jacob. The spot is mentioned in Genesis XXXV: 16-20: "And they journeyed. . . . And there was but a little way to come to Ephratha. . . . And Rachel died and was buried on the way to Ephratha, which is Bethlehem, and Jacob set up a pillar upon her grave" (see page 723).

A half day's walk from the tomb of Rachel is Hebron, in the Vale of Mamre. Here the Patriarchs pitched their tents while they were wanderers in the Promised Land. When in Egypt and of a great age, Jacob gave a charge: "I am to be gathered unto my people. Bury me with my fathers in the cave that is in the field of Machpelah, which is before Mamre. . . . There they buried Abraham and Sarah his wife; there they buried Isaac and Rebekah his wife; and there I buried Leah" (Gen. XLIX: 29-31).

Here, in Hebron, lies Machpelah, surrounded by a Cyclopean wall built of mammoth, finely-drafted stones of herodian period and workmanship, within a Moslem mosque that once was a church, erected by the Franks in 1167. Below is the burial cave itself, unopened, so far as historical documents record, since the Crusades.

Until the British occupation, entrance to the inclosure was denied to all but Moslems, only three parties of notables having gained admission through special favor of the Sublime Porte at Constantinople. King Edward, when he was Prince of Wales, was the first to enter. Emperor Franz Josef was the second visitor; and the Hon. Henry Morgenthau, while he was United States Ambassador to Turkey, was the third. The present writer accompanied the ambassador as American vice-consul and interpreter of the Arabic language. Hebron to-day is called *Khalil el Ruhman*, "The Friend of God," a name applied to Abraham in both the Old and New Testaments (II Chron. XX: 7, and James II: 23).

The Range of Moab, seen from Bethlehem, entrances the visitor. When the sun is rising over it, or when its summits, glowing with the reflected evening light, seem to be lit up from within, and are now an opalescent blue, now a rose pink, now a violet dying into black with the setting sun, its beauty beggars description. Gazing at it, one wonders which of the many peaks was Nebo and which the Pisgah whence Moses viewed a land he was never to enter (Deut. XXXIV: 1-4). Somewhere in the quiet unknown beyond Jordan is the burial spot of the great lawgiver.

Zigzag paths lead down from Bethlehem to the Shepherds' Village. Between the hamlet and the fields of ripening grain are the threshing floors. Somewhere in this fertile district Boaz, "a mighty man of wealth" (Ruth II: 1), had his fields.

HARVEST GOES ON AS IN THE TIME OF RUTH AND BOAZ

In the fields, the men, with their vivid orange turbans, white garments, and leather aprons, and the women, in their blue linen homespun and white flowing veils, work together, harvesting with the sickle. They cut the grain, small handfuls at a time, wrap each sheaf with a few straws, and cast it aside for another. Among the sheaves a less fortunate widow or orphaned daughter may be seen gleaning that which has been dropped by the reapers. The fields from which the sheaves have been removed the shepherds have invaded with their flocks.

Where the reapers are many, an estate owner stands, giving directions and encouraging by kind words. Harvesting thus with a simple sickle from early dawn through the greatest heat of the day until dark is the hardest work the peasants of Palestine have to perform; but they seem most joyous. They sing as they work. The passer-by calls out, "May Allah give you strength!" They reply, "May Allah preserve thee!" In such surroundings, the imagination has not far to run to reconstruct the historical picture of Boaz and Ruth the gleaner (see pages 705-707).

Camels carry the grain from the fields to the threshing floors. As the reaping proceeds, these floors are slowly stacked high with sheaves; then, when the harvest is over, the women and children, during the heat of the day, when the straw is brittle, drive shod cattle over the heaps. When trodden into fine chaff, the straw is forked by the men into a neat pile. At night the workers return to the village—all save the modern Boaz, who waits for

SHEEP KNOW THEIR OWN SHEPHERD

In the early morning, when the night vigils are over, the men start off with their flocks, each in a different direction. Though the calls sound exactly alike to the uninitiated, the animals never mistake their master's voice or follow a stranger (see John X: 1-15).

the late evening or early morning zephyrs to help him winnow out the grain. When the breezes die out, his work is done and he lies down by the pile of newly separated grain to get his night's rest.

THE GLORY OF HERODIUM NOW IS DUST

As the visitor turns from these pastoral scenes to let his eyes wander over the panorama spread out before him, a unique mountain in the desert attracts his attention because of its shape and location. It resembles in form an extinct crater. Its Arabic name is *Jabal el Fureidis,* "The Mountain of Paradise"—a name not well befitting its present state (see Color Plate V).

Here was a natural hill, which Herod the Great heightened by artificial means to make a fitting site for his castle. Human energy meant nothing to this cruel monarch. Slaves labored in an agony of toil while water was brought by a conduit from a distant spring to fill a large masonry reservoir at the base of the mountain, and a wide flight of steps was constructed leading up to the castle with its four towers.

The palace of Herodium was one of the many structures that this Herod built and embellished. He converted the desert here into a veritable Paradise. The historian Josephus gives an adequate description of this palace that is fully confirmed by what is left of its ruins.

The top of this oasis castle must have provided a superb view. Bethlehem, the Dead Sea, the Range of Moab, and great stretches of desert lie about it in cyclorama. Undoubtedly it was the strategic position of the spot that caused Herod to expend so much to reclaim it from the wilderness.

The statement, "Jesus was born in Bethlehem of Judea in the days of Herod the king" (Matt. II: 1), acquires new meaning to one who realizes how near Bethlehem was to this palace. It was this very Herod who caused to be slain the babes in Bethlehem in an effort to end the life of the Manger Child. Herod, it is recorded, died in Jericho, and his body

DESERT SHEPHERDS COME TOGETHER FOR THE MIDDAY MEAL

It is an ancient custom among the keepers of the flocks to congregate at some stream or fountain to partake in common of the food sent out to them from the villages. They are friendly, hospitable folk.

was brought up and buried in this very mountain. Here the Crusaders offered their last prolonged resistance to the Moslems, from whom it gets its present name, Frank Mountain.

THE DOMED ROOM IS THE CHIEF FEATURE OF THE BETHLEHEM HOME

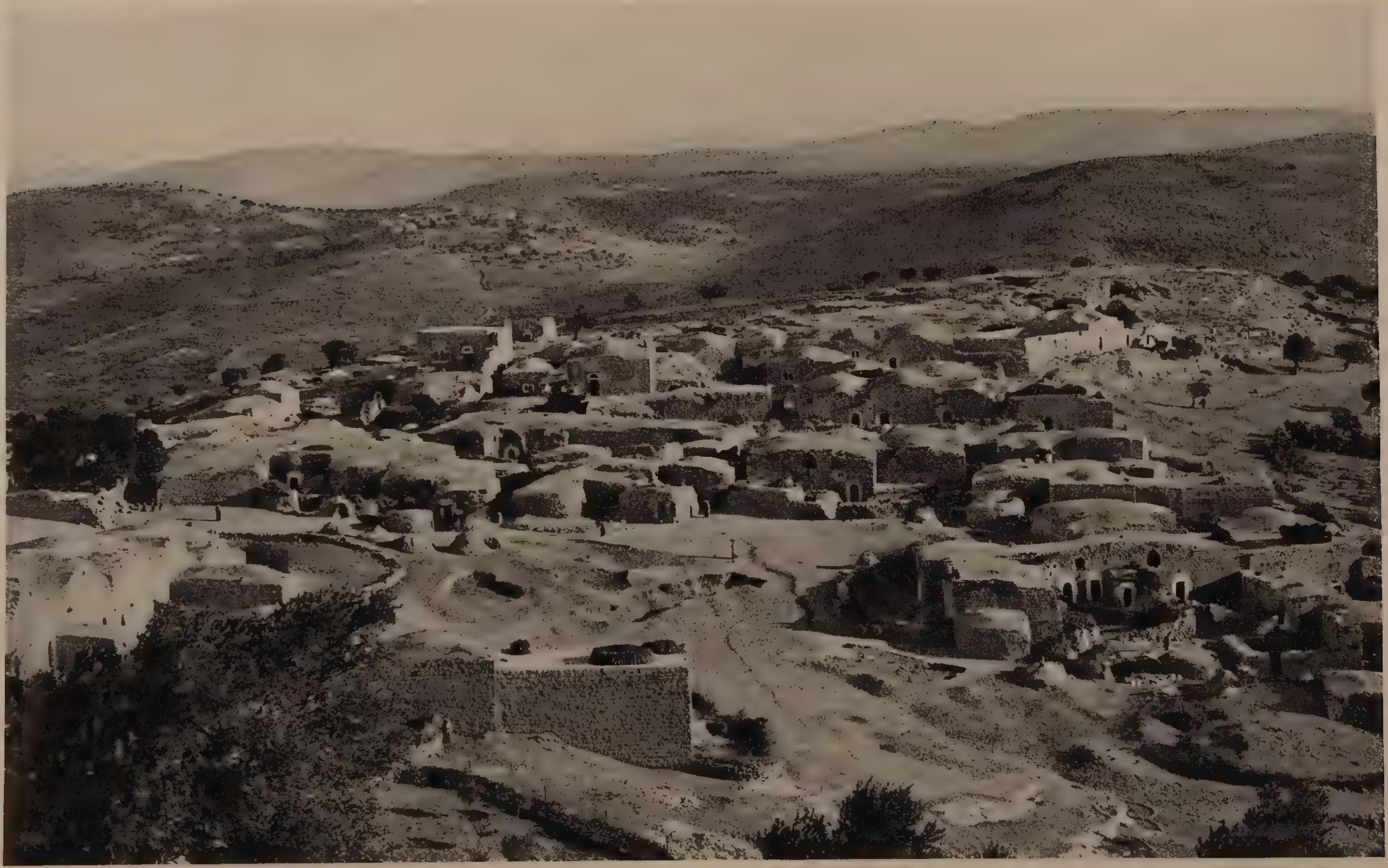
When I visit the Shepherds' Village, the natives gladly offer a view of the interiors of their quaint homes. They describe themselves as very "antiqua," and all have a good laugh over it. Adjoining one home is a large rock cavern, within which is an oil press used during the harvesting of the autumn olive crops. The place is dark, for it is lighted only by clay saucer lamps with wicks fed by olive oil. The entrance is so small that, to turn the oil mill, a mule has to be used instead of a camel, the usual motive power (see page 724).

A home consists of one large domed room. Within, a platform, uplifted on arches, serves as the abode of the family. Below this are the fold of the sheep and the stone mangers. Some of these houses, built against the sides of the steep mountain, are partly caves. They illustrate clearly how the present grotto in the Church of the Nativity at Bethlehem could have been part of a human abode that First Christmas (see page 719).

CHILDREN ARE THE PEASANTS' GREATEST JOY

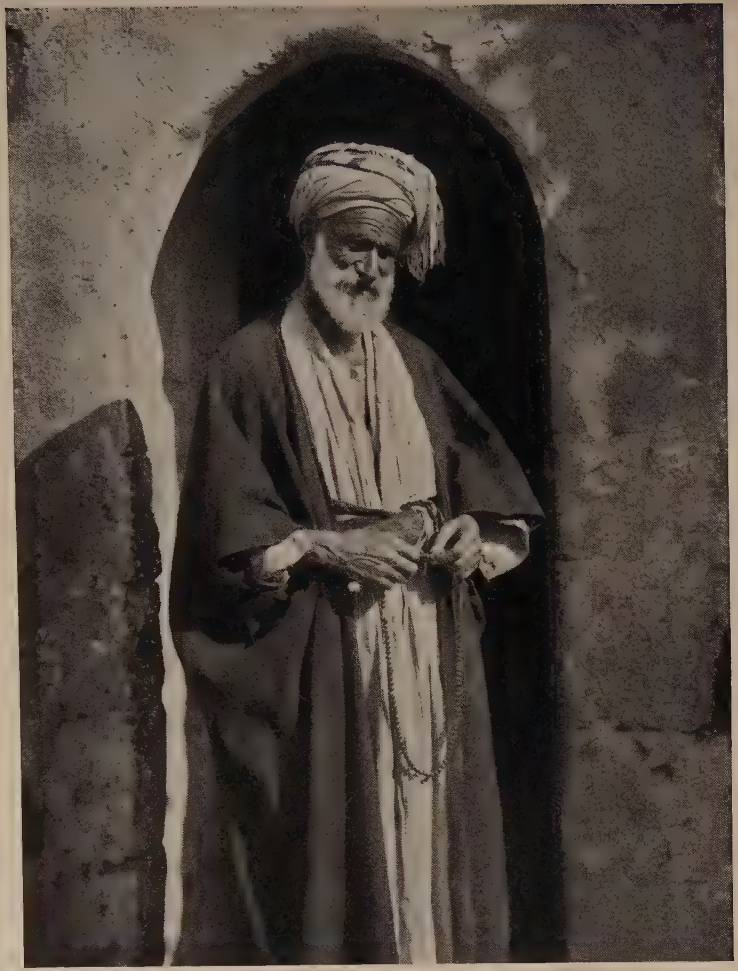
Among these peasant folk, as throughout the Holy Land, all children are loved and boys are especially favored, for the parents believe that "children are an heritage of the Lord, and the fruit of the womb His reward" (Psalm CXXVII : 3). The greatest calamity that can befall a woman is to be barren, and the next not to be the mother of a "man child," to use the Bible phrase (1 Sam 1: 11-16).

When the little one arrives, it is rubbed with salt, and then, with arms tightly pressed against the body, it is wrapped in a swaddling cloth and firmly bound about with winding tape. Babies are kept salted for a week, and swaddled for from four



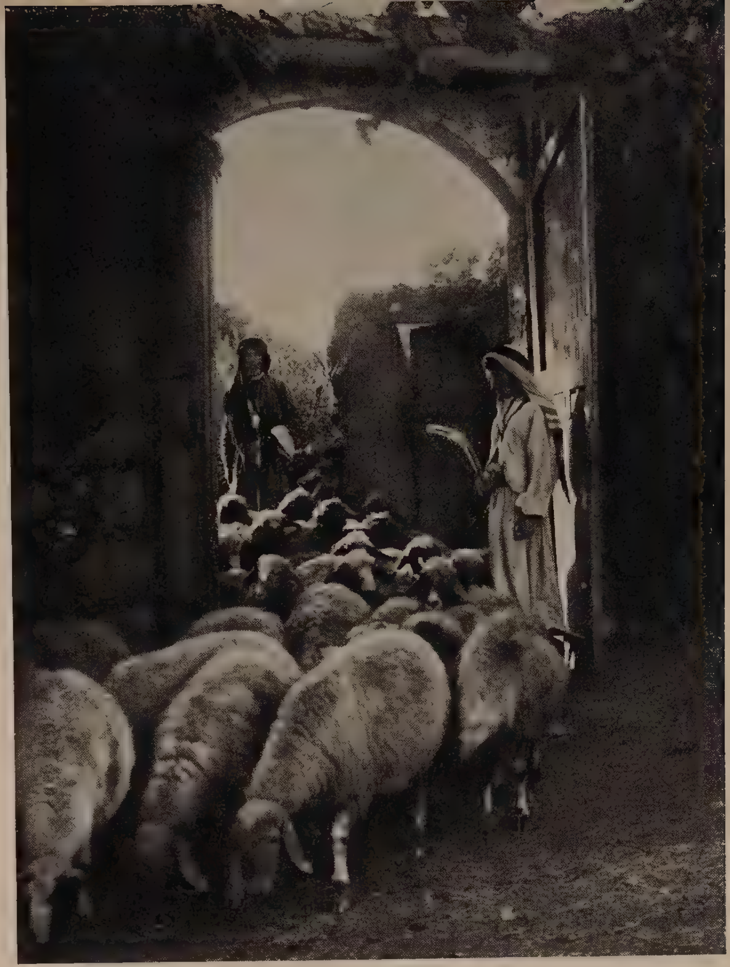
KUFR MALEK IS AN ANCIENT SHEPHERD VILLAGE

Abu Dahoud (see opposite page) and his people live like the patriarchs of David's time, in this little town 20 miles north of Bethlehem. Their homes are all of massive stone construction with flat mud roofs. Because flowing water is plentiful near by, many large flocks are pastured here.



KINDLINESS CHARACTERIZES THE SHEIK OF KUFR MALEK

Though Abu Dahoud is a Mohammedan, he gave the author his first introduction to the Christmas nights with the shepherds. The venerable village chief stands in his doorway telling his Moslem beads.



AS THEY ENTER THE FOLD, SHEEP PASS UNDER THE ROD

This method of counting the flocks dates from the time of Abraham. The shepherd stands at the door and makes note of each animal as it comes in.

LIKE DAVID OF OLD, THE SHEPHERD BOY LEADS HIS FLOCK

In the Wilderness of Judea, near the Jordan Valley, sheep must wander far in search of forage, and for that reason they are less numerous than they were in Biblical times (see text, page 734). Here some are feeding on the dry grass of the desert.

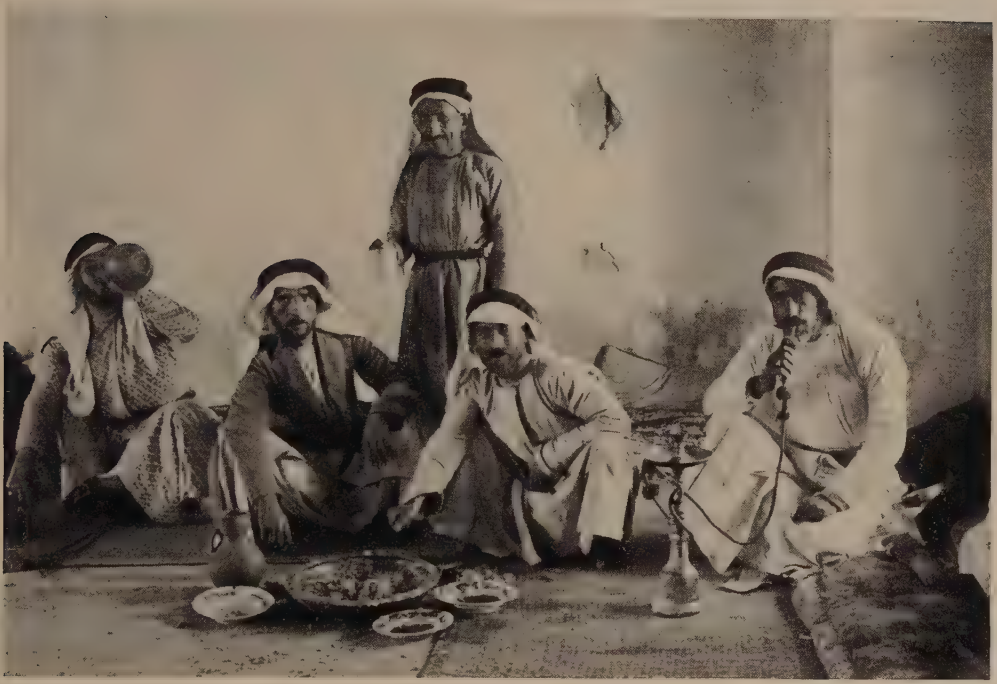
to six months. This Eastern custom explains the meaning, otherwise unintelligible to the Western mind, of Ezekiel's words, "in the day thou wast born thou wast not salted at all, nor swaddled at all" (Ezekiel XVI: 4). This salting and swaddling are supposed to benefit and strengthen the child for life, and none is thought properly cared for if the procedure is omitted.

Mary and Joseph, arriving and finding no room in the village caravansary or inn, were welcomed by just such humble folk as those who now live in the Shepherds' Village, and in a house, part stable, part human abode, Jesus was born, swaddled, and laid in a manger (see page 719).

The prevailing Western idea that Mary and Joseph, when denied admission to the inn, found a refuge in its adjoining stables is unthinkable to any who know the East and the simple but abundant hospitality of its people. Of the Three Wise Men the Gospel chronicler relates that "when they came into the house they saw the young child with Mary his mother" (Matt. II: 11).

On the climb back to Bethlehem from the Shepherds' Village, one has time to notice the terraced vineyards and the fig and olive groves extending from one hill to another over much of the surrounding country. Here the Bethlehemites live in summer when the fruit ripens. In some orchards small houses are built, but most have only watchtowers, simple affairs constructed of field stones. Usually the olives are planted alone, and the vines share the ground, with fig trees, pomegranates, and almonds scattered about in joyous confusion. Around all is a low wall built of loose stones. In some of these vineyards ancient Hebrew presses are still in good preservation. They are cut in the rock—large shallow vats, in which the grape clusters were trodden by human feet. The juice runs into a settling basin, whence it is dipped into "bottles" newly tanned from goatskins (Luke v: 37).

These vineyards are just as they were when Jesus spoke his parable, "A certain man planted a vineyard, and set an hedge



EACH VILLAGE HAS ITS GUEST CHAMBER

As in the days when Jesus bade his disciples to serve the Passover meal in the upper room (Mark XIV: 14-15), Abu Dahoud, chief of the village of Kufr Malek, entertains visitors in a chamber on the second floor of his house. Women never eat with men save those of their own family (see, also, illustrations, pages 728, 729).

about it, and digged a place for the winefat, and built a tower" (Mark XII: 1).

WATER IS STORED IN ROCK-HEWN CISTERNS

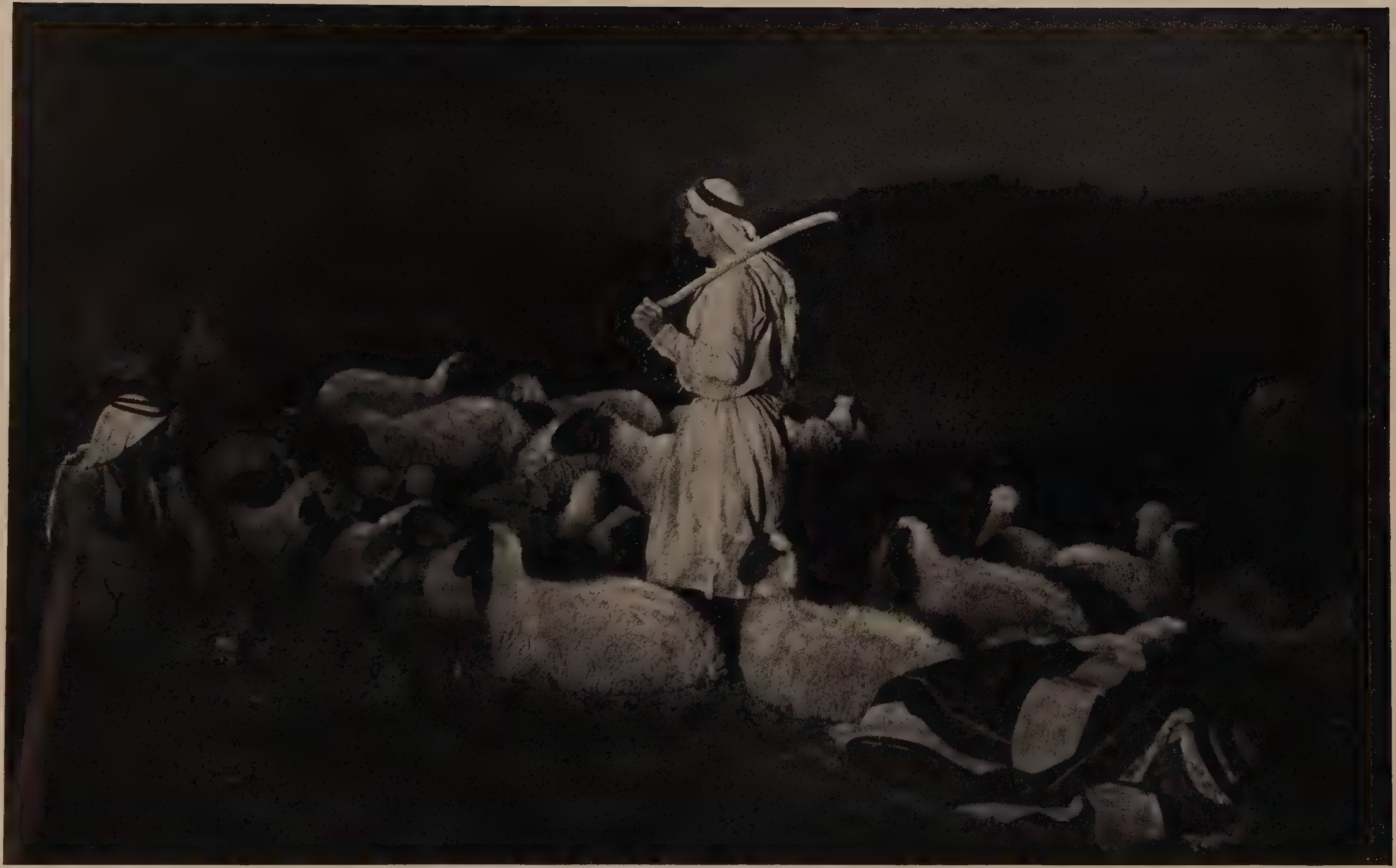
In each vineyard a cistern is dug for water, collected from the winter rain for use during the summer. Hewn in soft, chalklike rock, these cisterns are bottle-shaped, with narrow necks expanding to greater width below.

Because the cisterns are dug deep into rock, the water in them keeps delightfully cool throughout the hot summers. Many a Bethlehemite boasts that the water of his vineyard is the coolest in the mountain. On a recent visit to these resorts, I made a halt to draw a drink from such a cistern. A Bethlehem friend, as he drank, longed for his father's vineyard, where, he said, the water was so cold that one could not drink a glassful without taking it from the lips three times.

It is only after one knows thirst in the desert, and the natives' appreciation of their rock-hewn cisterns, that one can adequately picture David out in the parched wilderness, in the cave of Adullam in the heat of harvest time, weary from long fighting with the Philistines, longingly saying, "Oh that one would give me drink of the water of the well of Bethlehem which is by the gate!" (II Sam. XXIII: 15).

A visit to Bethlehem would be incomplete without further reference to David. The town has been called "The City of David" (Luke II: 4), though the name is applied more correctly, perhaps, to Jerusalem (I Kings II: 10).

Little of David's life in Bethlehem is recorded; for, although it was his birthplace, he did not dwell here long. Here Samuel anointed him king while he yet kept his father's sheep (I Sam. XVI: 11-13). Thereafter Bethlehem ceased to be his home. He followed King Saul for some time, until Saul's love for him changed into jealousy and bitter hatred and made him for years a pursued outcast in the wilderness of Engedi and Tekoa and around the cave of Adullam.



MIDNIGHT WATCH IS KEPT WHILE BETHLEHEM SLEEPS

One shepherd patrols the night camp as the others place their robes in a circle about the combined flock and compose themselves to rest. In the right background rises the dim outline of the town of the Nativity.

STILL THE SHEPHERDS ABIDE IN THE FIELDS KEEPING WATCH OVER THEIR FLOCKS BY NIGHT

To go out with the guardians of the sheep and keep vigil with them under the stars is to be carried back through the centuries to the First Christmas, for the scene of the watch to-day is exactly as it was when Jesus was born (see text, page 734).

AT SUNSET SHEEP ARE DRIVEN TOWARD THE NIGHT CAMP

It is a custom thousands of years old for the shepherds to bring their flocks together at some prearranged spot when darkness falls. This man is just starting for the meeting place.

After Saul's death David reigned for seven years in Hebron, and then for 33 years in Jerusalem, where he died. He never returned to his native town.

WATCHING WITH THE SHEPHERDS IN THE FIELD

In the old churches in Bethlehem no altars have been erected to David. No spots are pointed out as connected with his young life. Throughout this country it is in the vast out-of-doors that one can best visualize its past and realize its great significance. To find David in Bethlehem, one must seek the son of Jesse, "ruddy, withal of a beautiful countenance," on the hills where the shepherds roam. To know Christmas in Bethlehem, one should pass it not in the old churches, historically interesting though they be, but under the star-studded dome of the great out-of-doors, with the shepherds watching over the flocks in the field by night.*

When the village pastures have been expended, the shepherds withdraw into the Wilderness. With no caves or cotes for nightly protection, they club together and from eve until morning keep vigilant watch. I have spent many nights with these simple people, out in the open desert.

After the evening meal, the chief sets

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* See "Among the Bethlehem Shepherds," by John D. Whiting, in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1926.

AS PIPERS, THE OLDER SHEPHERDS EXCEL

On this simple instrument the desert musician produces appealing strains (see Color Plate II). The extra length of reed makes possible deep bass tones.

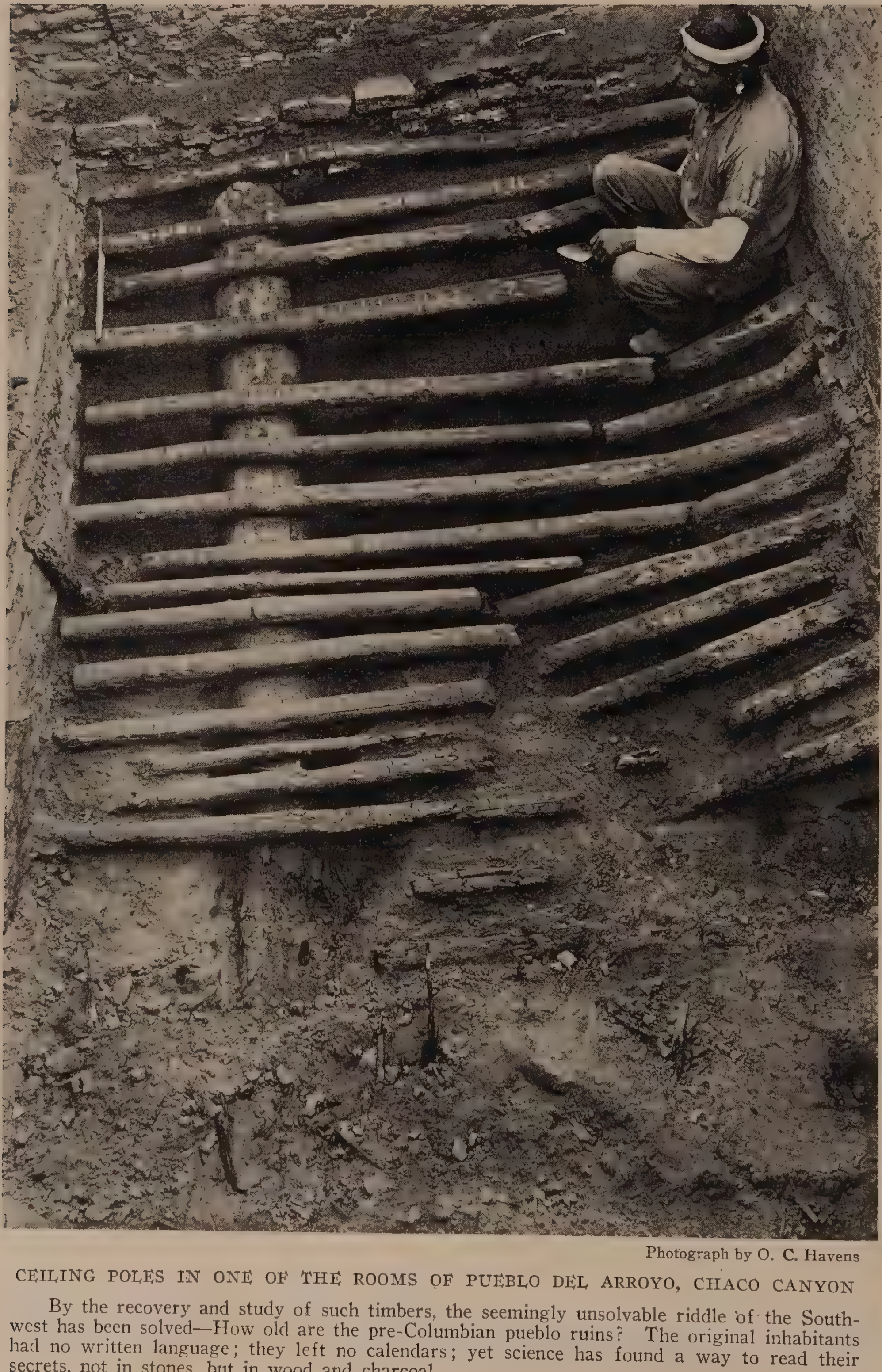
the watches, for it is already dark in this land of short twilights. Taking for a guide a bright star, he measures with outstretched arm its course through the sky. Each span is to be one watch, in which two will keep guard together.

Now the first guards, with rod and staff, move about the outside edge of the flock. From time to time the yelp of a wild jackal or the laugh of a striped hyena causes the sheep to stir as if to stampede; but reassuring calls from the watchers quickly restore quiet.

The shepherds not on guard lie down to rest, spacing their places of repose in a rough circle around the fold.

The first three or four watches bring the midnight to deepen the star-studded indigo. Silhouetted against the sky is the faint rim of the mountains that shut out the world and more than 1,900 years of time. It is as if the world were transplanted into the past. St. Luke's account of the First Christmas repeats itself: "And there were in the same country shepherds abiding in the field, keeping watch over their flocks by night."

When the pink of dawn heralds the birth of a new day, the shepherds are astir, talking one to the other. As they start up the inclines, it seems almost that they are saying, "Let us now go even unto Bethlehem and see this thing which has come to pass" (Luke II: 15).



Photograph by O. C. Havens

CEILING POLES IN ONE OF THE ROOMS OF PUEBLO DEL ARROYO, CHACO CANYON

By the recovery and study of such timbers, the seemingly unsolvable riddle of the Southwest has been solved—How old are the pre-Columbian pueblo ruins? The original inhabitants had no written language; they left no calendars; yet science has found a way to read their secrets, not in stones, but in wood and charcoal.

THE SECRET OF THE SOUTHWEST SOLVED BY TALKATIVE TREE RINGS

Horizons of American History Are Carried Back to A. D. 700 and a Calendar for 1,200 Years Established by National Geographic Society Expeditions

TWO series of National Geographic Society expeditions, one which explored the now famous Pueblo Bonito ruins in Chaco Canyon, New Mexico, and the other which sought to ascertain the actual age of those ruins, have culminated in findings of prime importance to the history of pre-Columbian America.

They have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic.

They have discovered not only the age of the great communal dwelling of Pueblo Bonito, metropolis of our aboriginal Southwest, but also have dated some 40 other ruins whose time of occupancy hitherto had been unknown.

Moreover, they have developed a tree-ring calendar which can be applied to all early ruins in which datable timbers exist.

A collateral finding of great interest, yet to be developed, is the possible relation between the weather cycles clearly revealed in this tree-ring calendar of the southwestern United States and similar cyclic variations being recorded by a third National Geographic Society Expedition (in conjunction with the Smithsonian Institution), an expedition which still is in the field, at Mount Brukkaros, South West Africa, making daily observations of solar radiation.

Members of The Society have received reports in the NATIONAL GEOGRAPHIC MAGAZINE from time to time of the marvelous finds of the Pueblo Bonito Expeditions. One major question remained to be answered: "How old is Pueblo Bonito?"

Primarily to solve that problem, The Society invited Dr. A. E. Douglass to undertake the investigations which gave the answer, and far more—a chronology that includes many major ruins of the Southwest and thus dates the hitherto untimed annals of pre-Columbian history.

In the following summary of his work, Dr. Douglass relates the fascinating story of how he, an astronomer, was led from the study of sun spots to cutting tree and timber sections, which, when codified and joined together, yielded this priceless secret of North America's remote past.

The members of the National Geographic Society can obtain much satisfaction in having supported such important and successful explorations.

THE EDITOR.

BY ANDREW ELLICOTT DOUGLASS, SC. D.

Leader of the National Geographic Society Tree-Ring Expeditions and Director of Steward Observatory, University of Arizona

BY TRANSLATING the story told by tree rings, we have pushed back the horizons of history in the United States for nearly eight centuries before Columbus reached the shores of the New World, and we have established in our Southwest a chronology for that period more accurate than if human hands had written down the major events as they occurred.

We are now able definitely to announce the important dates in the history of Pueblo Bonito, oldest and largest of the great Indian communities, in Chaco Canyon, New Mexico, the exploration of which has been carried to completion by eight National Geographic Society expeditions.

Furthermore, we can now date nearly

Photograph by Neil M. Judd

EARLY SPANIARDS CARVED THIS OLD BEAM FOUND AT ORAIBI, ARIZONA

From such supporting timbers The Society's expedition could not cut full cross-sections. In these cases cores were drilled which showed the tree-ring sequences. The Indians consented when given small fees and bits of turquoise were deposited in the holes to "ward off the spirit of decay" (see text, page 753, and illustrations, pages 760 and 762).

forty prehistoric ruins in the Southwest and reconstruct there a succession of major events through which Indian settlements rose, passed their heyday, and disappeared.

Just as the far-famed Rosetta Stone provided the key to the written mysteries of ancient Egypt, so the collection of an unbroken series of tree rings has made clear the chronology of the Southwest.

Through this work we have learned of some outstanding events in America which were contemporaneous with the conquest of Spain by the Moors, and we know that certain Pueblo Indian settlements were enjoying their golden ages when William the Conqueror faced Harold the Saxon at the Battle of Hastings.

These researches have carried the calendar back to A. D. 700 in the Southwest, and they have provided the beginnings of a continuous weather chart for 1,200 years.

PRICELESS TREE TRUNKS HAVE BEEN BURNED

Many a prehistoric jewel has been given to the flames unwittingly because no one knew the importance of tree rings in recording the passage of years. Where fuel was scarce, fragments of precious timbers

Photograph by Charles Martin

WHITE HOUSE RUIN CLINGS TO THE CLIFFS OF CANYON DE CHELLY IN ARIZONA

Ancient house timbers found and studied here prove that this picturesque communal dwelling was built and occupied as early as 1060—a quarter of a century before the Domesday Book of medieval English history fame was compiled.

at many an ancient ruin in the American Southwest have been used as firewood by sheep-herder, prospector, and even archeologist. They were scraps of wood, nothing more. The Bible story of the stone which the builders rejected, but which became the head stone of the corner, has found a counterpart in the wood that the modern searcher overlooked, for it has become a key to prehistoric chronology.

Through long-past ages and with unbroken regularity, trees have jotted down a record at the close of each fading year—a memorandum as to how they passed the time; whether enriched by added rainfall or injured by lightning and fire. By learning how to read these records—specifically those of the pines—we have discovered a magic key to open mysterious books and interpret the meaning of their writings.

In favorable regions, rings in trees may be identified, each one in its appropriate year, and traced back till we get to the utmost reach of living trees, and then beams from ancient ruins and buried logs carry the story back for many more centuries.

Thus these tree records have provided us with an American calendar reaching

Photograph by Neil M. Judd

A NAVAJO MAN OF JADITO VALLEY

In this arid Southwest, man and tree alike cry always for water and more water. Tree rings reveal when rain fell or failed, and the Indian's most common invocation is his prayer for rain.

beyond the rise of Charles Martel or the Mohammedan invasion of India. Some of these trees were cut a thousand years ago. From them we have learned the exact building dates of major ruins of the southwestern United States as definitely as we have been able to fix the dates of Old World monuments of the ancients whose records are inscribed on stone.

A CHAPTER IN THE BOOK OF WEATHER FORECASTING

For the last six years this detective story of science has been evolving out in Arizona. Seen from one angle, it pushes back the bounds of history in our Southwest and gives us human activities—even tragedies — among the native inhabitants for hundreds of years. From another angle this history in trees tells us the climatic story of the Southwest with amazing accuracy.

When a real theory of climate has been developed and we can predict drought and flood over a period of years, this Arizona story in tree rings will have played a creditable part in developing that climatic foresight which is perhaps the most valuable economic advantage yet lying beyond our reach.

From this combination of climatic facts and human movements we have unearthed evidence of a human cycle, the time during which village Indians of the Southwest could live in one place till they depleted its resources and were compelled to move to new localities.

Success in ascertaining the age of Pueblo Bonito and many other prehistoric ruins throughout the Southwest is to be attributed primarily to the National Geographic Society, whose Committee on Research has sent various expeditions under the direction of Mr. Neil M. Judd to collect the vast number of specimens required in these investigations.* The University of Arizona has generously permitted me to devote much of my time to this objective for several years, and the interest of the Carnegie Institution of Washington in the climatic phases of this study really paved the way along which we advanced to our present, independent goal.

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* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "A New National Geographic Society Expedition," June, 1921; "The Pueblo Bonito Expedition of the National Geographic Society," March, 1922; "Pueblo Bonito, the Ancient," July, 1923; "Everyday Life in Pueblo Bonito," September, 1925; and "Exploring in the Canyon of Death," September, 1925.

READING THE DIARIES OF TREES

The method which we have used in extending the historical calendar of the Southwest is the outcome of a long attempt to read the diaries of trees. Every year the trees in our forests show the swing of Time's pendulum and put down a mark. They are chronographs, recording clocks, by which the succeeding seasons are set down through definite imprints. Every year each pine adds a layer of new wood over its entire living surface of trunk and branches.

If every year were exactly the same, growth rings would tell the age of the tree and little more. Only in rare cases would they record exceptional events of any interest to us. But a tree is not a mechanical *robot;* it is a living thing, and its food supply and adventures through life all enter into its diary. A flash of lightning, a forest fire, insect pests or a falling neighbor may make strong impressions on its life and go into its diary.

But in the arid regions of our Southwest, where trees are few and other vegetation scarce, the most important thing to man and trees is rainfall. So, in the rings of the talkative pines we find lean years and fat years recorded. The same succession of drought and plenty appears throughout the forest. This fact has helped vastly in our dating work, for certain sequences of years become easily recognized from tree to tree, county to county, even from State to State.

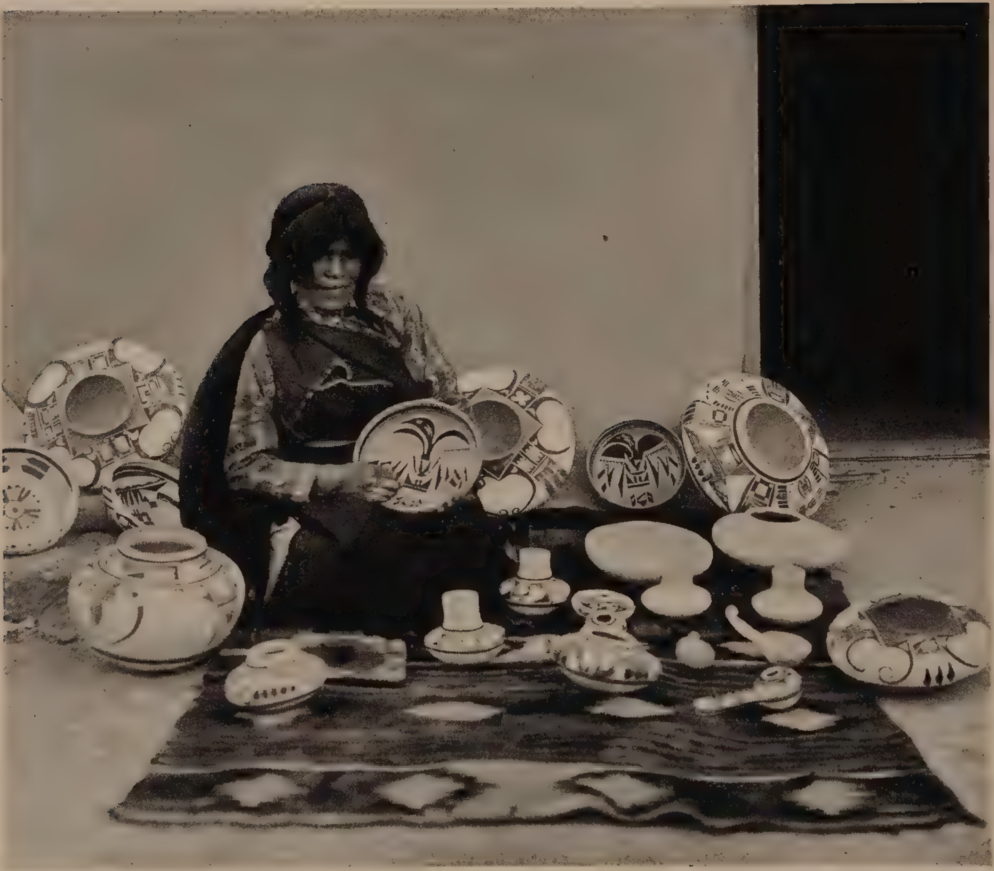
Photograph by Frederick I. Monsen

SCION OF ONE OF THE FIRST FAMILIES OF NEW MEXICO

This smiling Indian girl never heard of the tragic eras of drought through which her ancestors passed more than two centuries before Columbus discovered America; but the old, lifeless beams over which she has romped plainly record the dates and duration of such dry periods.

LIVING TREE RINGS MATCHED WITH DEAD TIMBERS

No living, diary-keeping tree in the semi-arid region inhabited by the Pueblo Indians goes back more than a few hundred years; and the giant sequoias of Cali-



Photograph from Dr. A. E. Douglass

NAMPEYO REVIVES A LOST ART

Hopi pottery flourished in the early Spanish era in the Southwest; then became decadent (see text, page 759). Thirty years ago this Hopi woman artist undertook to revive it and with notable success. Hopi pottery is of a rich cream color, of fine grain, hard texture, and rich ornamentation.

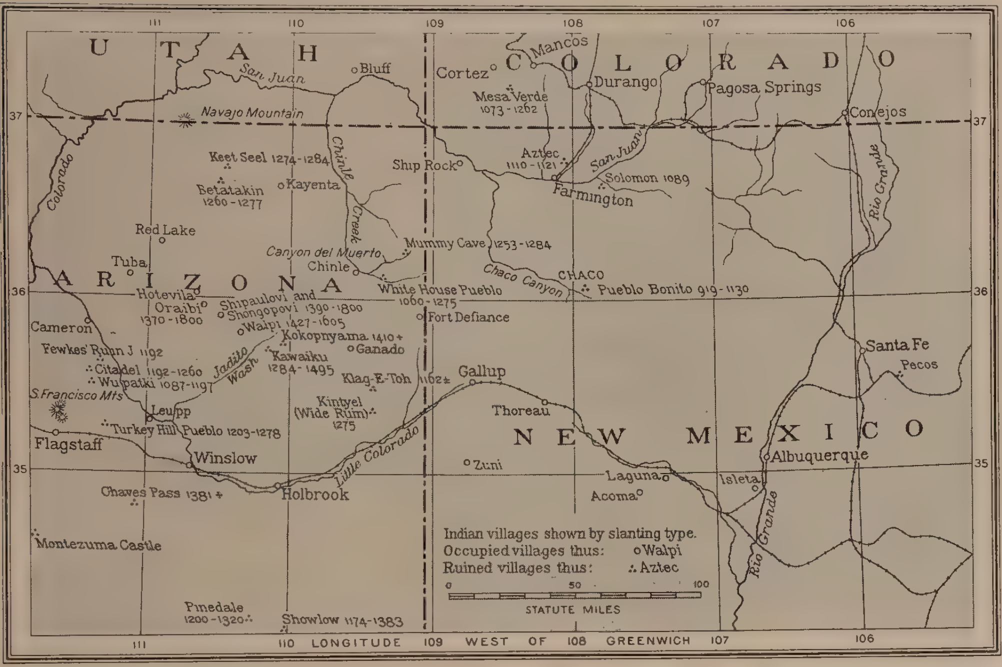
fornia register in a different way those seasonal fluctuations that control the pines of northern Arizona. So when we reached the earliest date which the oldest living weather-recording Arizona tree could tell us about, it became necessary to search for beams that had been cut and used by man before the now living trees took up the story. Here and there we found beams the latter years of which were contemporaneous with the early life of trees still living.

WHY STUDY TREE RINGS?

By arranging these beams in their proper sequence, so that the inner diary entries of each one dovetailed into and matched the outer entries of its predecessor (see illustrations, pages 760 and 769), we knew that we had an unbroken succession of beams and trees.

In this way, step by step, we pushed historical dates back further and further until we found a beam whose earliest ring was formed A. D. 1260 (see illustration, page 760), less than half a century after the Children's Crusade.

The development of this tree-ring study presents an example of how a scientific research starting with a definite idea may lead into unforeseen channels. Originally my work was a study of sun spots. It is known that there is a periodicity in their occurrence; they are most numerous at intervals of eleven years. As an aid in that astronomical investigation, I studied


UTAH
COLORADO
ARIZONA
NEW MEXICO
San Juan
Bluff
Cortez
Mancos
Durango
Pagosa Springs
Conejos
Mesa Verde 1073-1262
Navajo Mountain
Colorado
Keet Seel 1274-1284
Chinle Creek
Ship Rock
Aztec 1110-1121
San Juan
Solomon 1089
Farmington
Rio Grande
Betatakin 1260-1277
Kayenta
Red Lake
Tuba
Canyon del Muerto
Chinle
Mummy Cave 1253-1284
Chaco Canyon
CHACO
Pueblo Bonito 919-1130
White House Pueblo 1060-1275
Hotevila
Oraibi 1370-1800
Shipaulovi and Shongopovi 1390-1800
Walpi 1427-1605
Fort Defiance
Cameron
Kokopnyama 1410+
Ganado
Fewkes' Ruin J 1192
Kawaiku 1284-1495
Citadel 1192-1260
Wupatki 1087-1197
Jadito Wash
Klag-E-Toh 1162±
Gallup
Santa Fe
Pecos
S. Francisco Mts
Leupp
Kintyel (Wide Ruin) 1275
Thoreau
Turkey Hill Pueblo 1203-1278
Flagstaff
Winslow
Little Colorado
Zuni
Albuquerque
Laguna
Isleta
Acoma
Chaves Pass 1381+
Holbrook
Montezuma Castle
Rio Grande
Indian villages shown by slanting type.
Occupied villages thus: Walpi
Ruined villages thus: Aztec
0 50 100
STATUTE MILES
Pinedale 1200-1320
Showlow 1174-1383
111 110 LONGITUDE 109 WEST OF 108 GREENWICH 107 106
37
36
35

Drawn by A. H. Bumstead

TREE RINGS HAVE GIVEN DEFINITE DATES TO THESE INDIAN RUINS

In many instances one group name is applied to several ruins. For example, in the Chaco group, various portions of Pueblo Bonito were under construction at different times—919, 1017, 1033-92, 1102, and 1130; Pueblo del Arroyo was being built in 1052-1103. In the Mesa Verde group, Cliff Palace is dated 1073; Oak Tree House, 1112; Spring House, 1115; Balcony House, 1190-1206; Square Tower House, 1204, and Spruce Tree House, 1216 and 1262. Mr. Earl H. Morris, in collaboration with the author, supplied beams from which the dates 1110-21 for Aztec Ruin and 1133-1135 for cliff dwellings in Grand Gulch, Utah, were ascertained. In the Chinle district Mr. Morris aided in fixing the years 936-57 for Sliding Ruin, 1253-84 for Mummy Cave, and 1060-96, 1219, and 1275 for White House Pueblo.

trees, for solar changes affect our weather, and weather in turn affects the trees in Arizona's dry climate, as elsewhere.

Our study of sun spots and their influence upon weather and the consequent effect upon vegetation as recorded by tree rings progressed most successfully. The first confirmation of our general interpretation of a relationship between tree rings and sun-spot periods came in a most dramatic way.

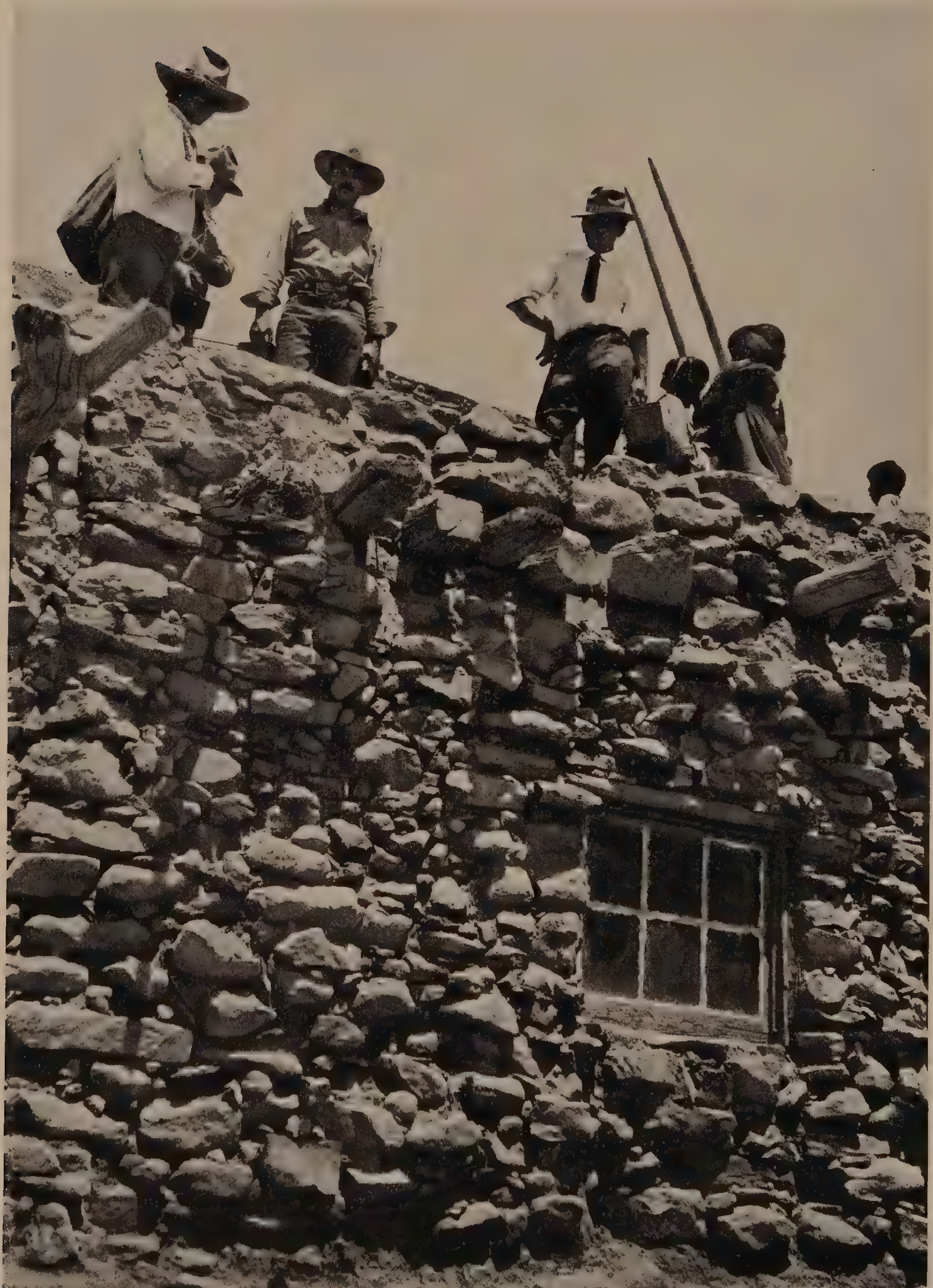
Evidence of the eleven-year sun-spot cycle had been easily found in Arizona pine trees. The regularly recurring periods had been recorded for 500 years by tree rings, *except for the interval from 1650 to 1725.* During that 75 years the tree rings gave no evidence of periodical changes in the weather such as were to be expected.

Several years after we had encountered this puzzling fact the late Dr. E. Walter Maunder, an eminent English astronomer, unaware of my findings, wrote to me that he had discovered that *there were no sun spots between 1645 and 1715,* and that if my tree rings did not indicate some effect of this absence of sun spots, my work was being conducted on an erroneous hypothesis.

TREES ARE NATURE'S RAIN-GAUGES

The coincidence between the failure of Arizona trees to register any sun-spot effect upon the weather during those years, and establishment of the fact, by entirely independent study, that the customary sun-spot cycle did not occur during approximately the same period of years helped confirm the relationship between the growth of trees and solar changes.

The remarkable dependence of rings in



Photograph by Dr. A. E. Douglass

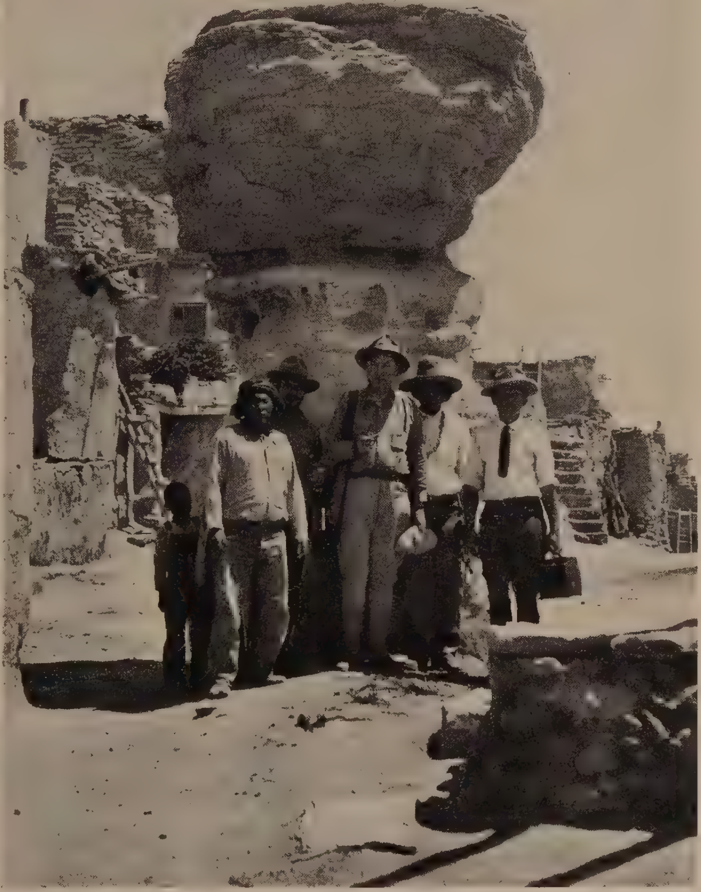
OLD BEAMS IN A MODERN HOPI DWELLING AT WALPI (SEE, ALSO, PAGES 745 AND 761)

Prehistoric pines trimmed with stone axes and saw-cut cottonwood logs may roof a Hopi house to-day. Windows and first-story doors are fairly recent innovations, for fifty years ago the Hopi were still fearful of Navajo and Apache depredations. The builders of Hano, inseparable from modern Walpi, were invited from the Rio Grande Valley about 1700 to help ward off successive enemy raids.

the Arizona pines on rainfall, and especially on winter precipitation, showed that trees are Nature's rain-gauges, and in them we now have the history of drought and plenty in this plateau country for 1,200 years. We can point to certain years, such as 1632, 1379, 1067, and 840, and say definitely that they were years of excessive drought in this region.

Having established such facts, the transition to archeology is easy, for if the rings in a prehistoric roof beam can be dated by these known drought years, then surely it is easy to tell when that tree was cut by the Indians for purposes of building, for such cutting date is the year of—or that next following—the outermost ring, if the tree section be complete.

In 1922 Mr. Judd, leader of The Society's expeditions into Chaco Canyon, after learning of my use of tree rings in ascertaining the comparative ages of Aztec Ruin and Pueblo Bonito, expressed the belief that extension of the method could definitely date Pueblo Bonito, provided enough beams of different ages could be found. With his active coöperation, three expeditions were sent into the field by the National Geographic Society to obtain the necessary beams.



Photograph by Dr. A. E. Douglass

THE FIRST TREE-RING EXPEDITION IN THE PLAZA AT WALPI

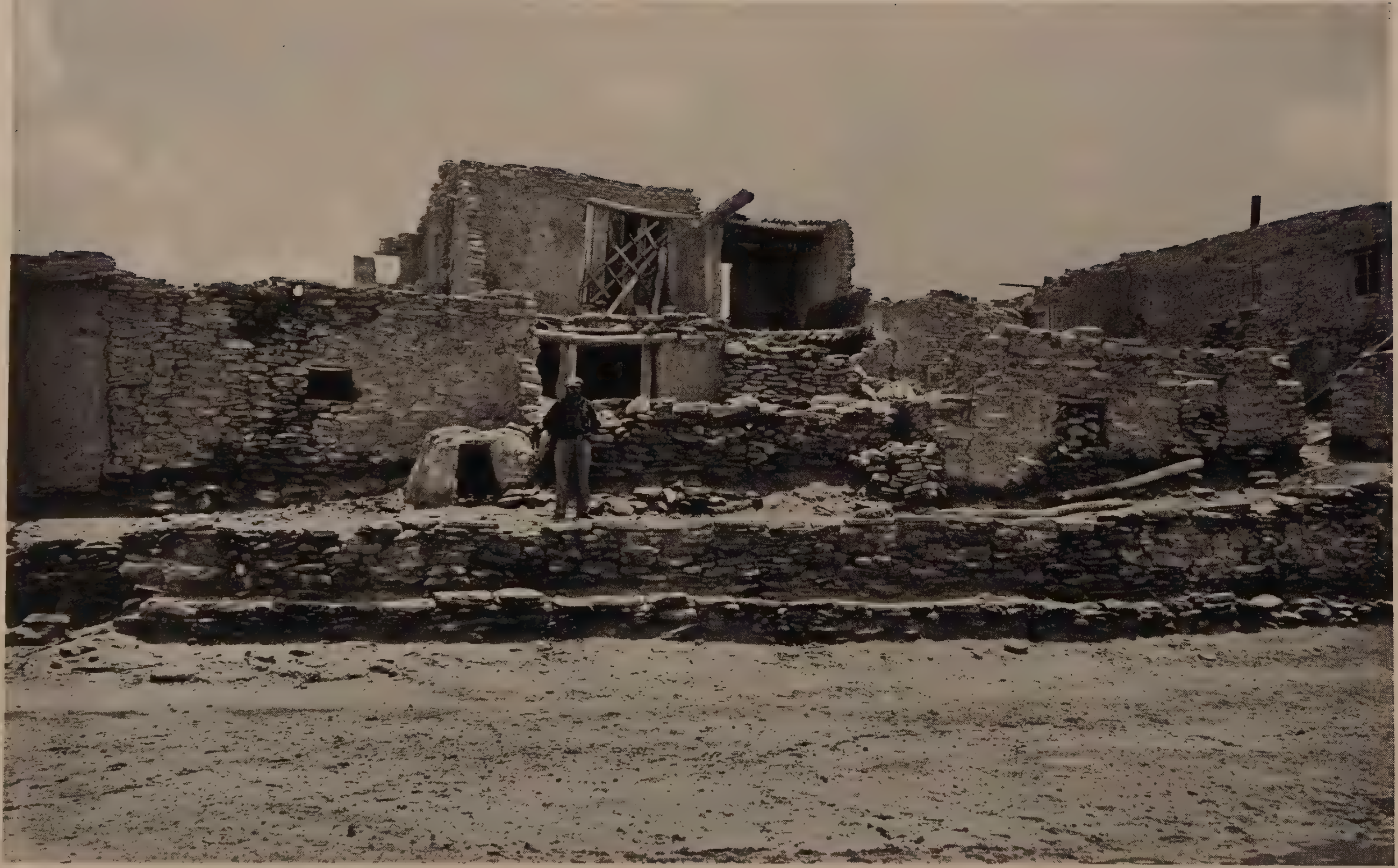
The oldest timbers found at Walpi were cut 65 years before Columbus discovered America.

THE FIRST EXPEDITION INVESTIGATES HOPI VILLAGES

In the early development of the chronology of the ruins of Arizona and New Mexico, the material brought in by Mr. J. A. Jeancon and Mr. O. G. Ricketson, Jr., of The Society's first expedition in search of beams, was invaluable. The expedition started from Flagstaff in June, 1923, and first visited the Hopi villages, where I accompanied them as supercargo for ten days. It was my first experience in picking up old, dried-up pieces of wood, which had formed portions of Indian houses, and trying to assign exact dates to them.

The experience developed only slowly toward satisfactory results, for while the age of some of the pieces was promptly recognized by comparison with Flagstaff trees, others leaped over the centuries and the time when they flourished was still a mystery.

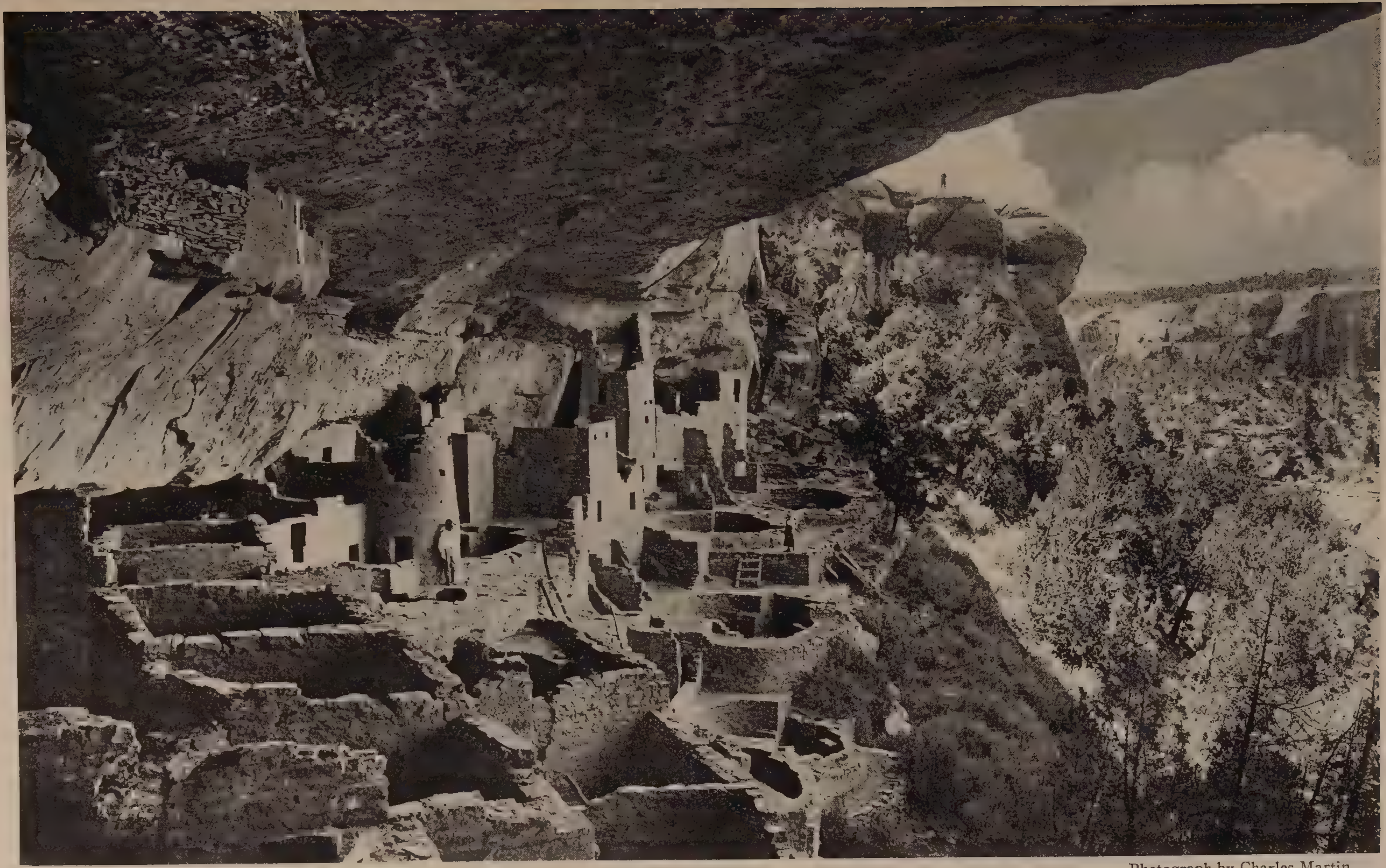
Jeancon and Ricketson proceeded to



Photograph by Neil M. Judd

FROM THIS OLD HOUSE AT ORAIBI CAME THE BEAM WHICH CARRIED HISTORIC CHRONOLOGY BACK TO 1260

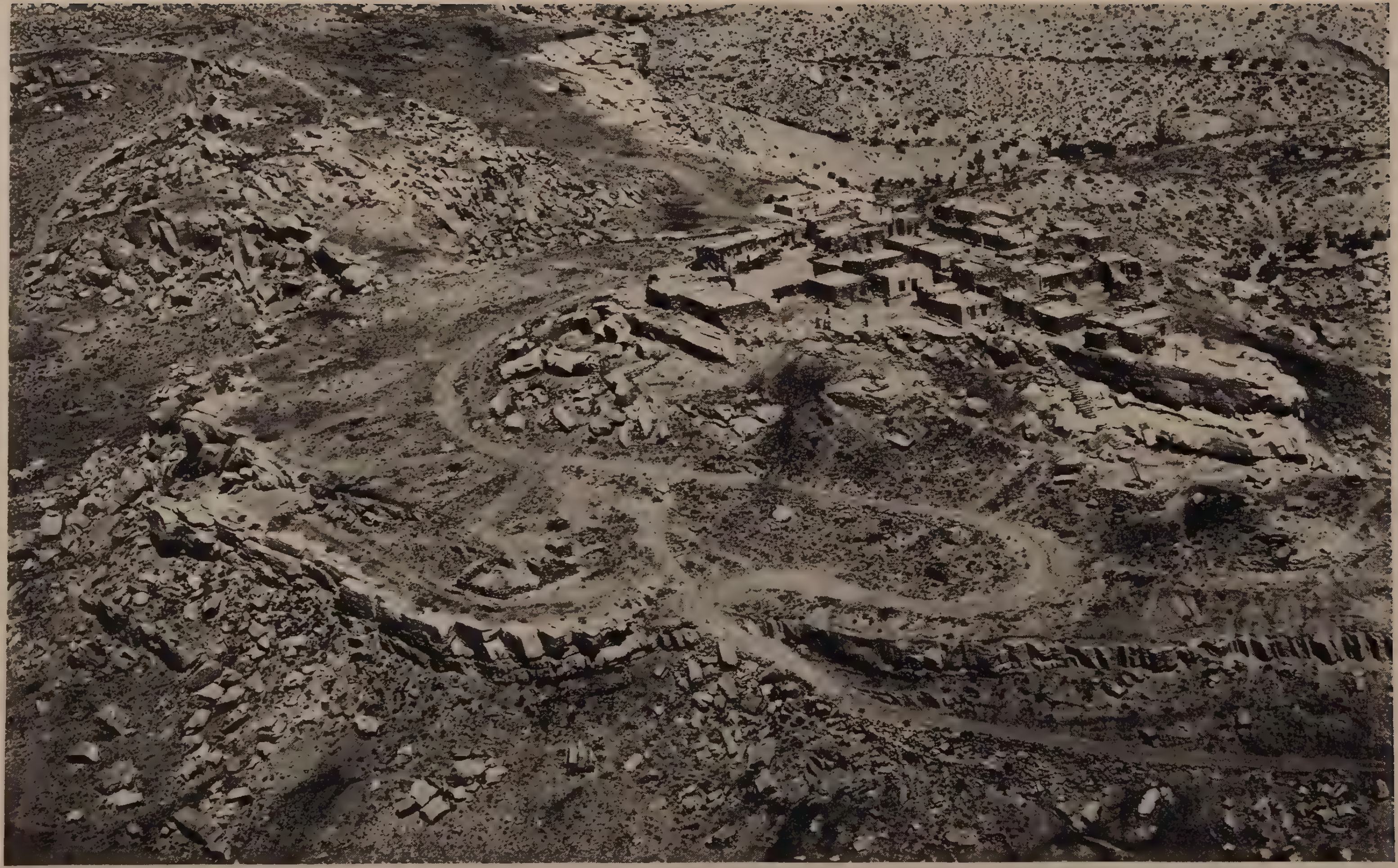
The log which proved to be such an important link in the investigations of The Society had been cut in 1370, when it was 110 years old, and had rendered more than five centuries of service. It now is safely preserved in a tree-ring laboratory in Tucson, Arizona (see, also, text, page 754, and lower illustration, page 760).



Photograph by Charles Martin

THE CLIFF PALACE, A REMARKABLE CENTER OF EARLY CIVILIZATION: MESA VERDE NATIONAL PARK, COLORADO

In this romantic ruin was found a log whose ring count showed that it was cut in 1073.



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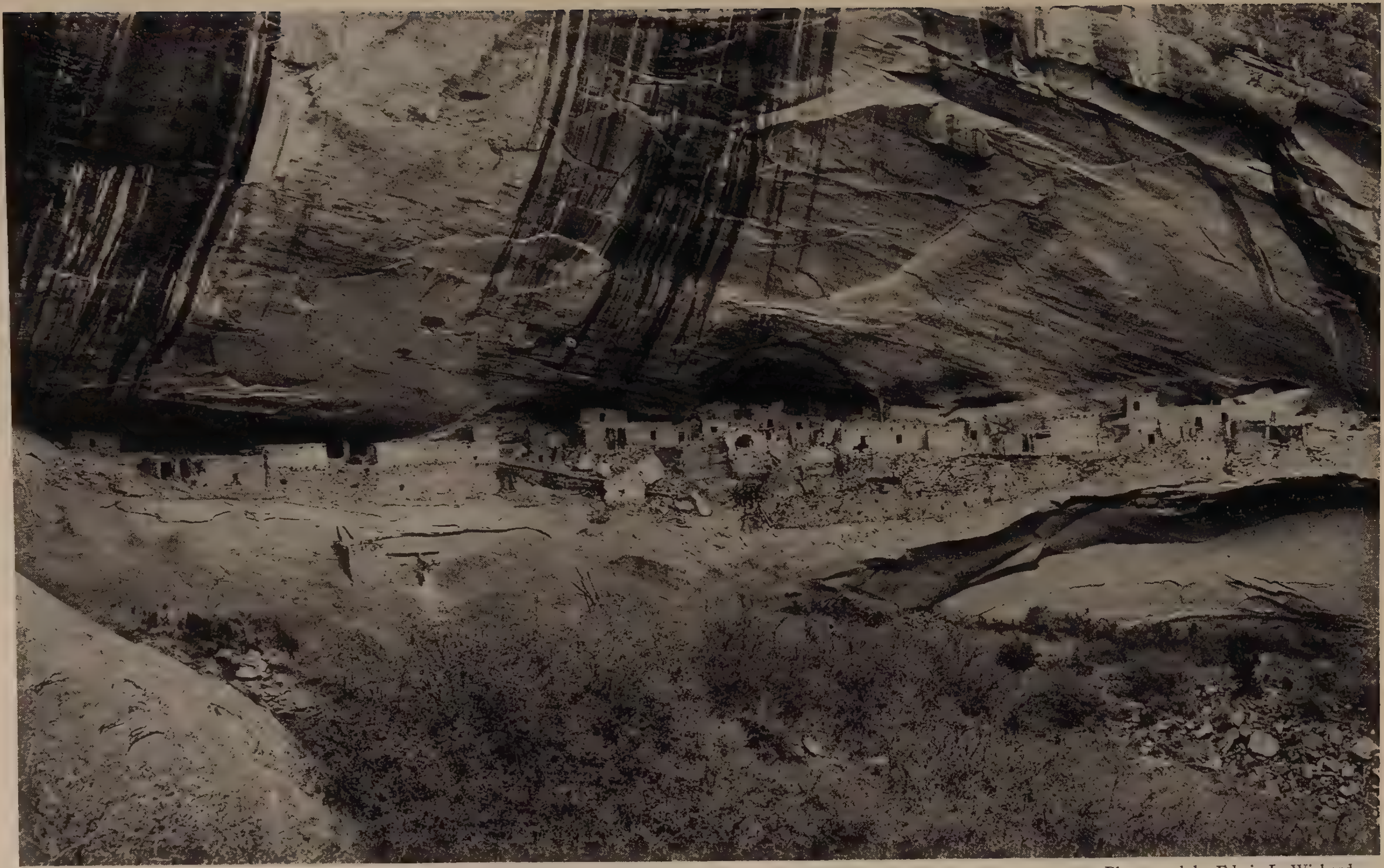
SHIPAULOVI, A HOPI TOWN, SEEN FROM AN AIRPLANE

Through such villages three expeditions of the National Geographic Society searched for timbers which might establish the chronology of our prehistoric Southwest. Gifts of velvet, old felt hats, and turtle shells won the confidence of many suspicious Indians (see text, pages 752 and 756).



Photograph by Edwin L. Wisherd

KEET SEEL, THE LARGEST KNOWN CLIFF RUIN IN ARIZONA

From the rings of some of its timbers it was learned that Keet Seel was inhabited as early as 1274. The ruin is a part of Navajo National Monument.

Photograph by O. C. Havens

CEILING POLES AND A HATCHWAY AT PUEBLO BONITO

The timbers at this metropolis of the once prehistoric Southwest are unimpeachable witnesses of the sequence of events through many centuries. One beam from Pueblo Bonito tells us that it began to grow in the year 700 and had attained the age of 219 years when the Bonitan builders, with their stone axes, cut it down for use in erecting their great communal center (see text, page 767).

examine certain old ruins on the mesa to the north of the Hopi villages—Fire House to the east; Wide Ruin, south of the latter; and the ruins of Chaco Canyon, Mesa Verde, and the Rio Grande Valley. As a result, 100 excellent timber specimens came to me for examination.

This material was examined as fast as time allowed. In July, 1927, it was evident that a new chronology had been discovered. Wupatki and Citadel ruins, near Flagstaff; Mummy Cave, in Canyon del Muerto, and Mesa Verde, in southwestern Colorado (see map, page 743), had first been developed, each by itself, into local chronologies covering 100 years or more. Subsequently it was found that all three joined into one continuous sequence 180 years in length.

Archeologists agreed, from study of the cultural remains, that these ruins were generally later than Pueblo Bonito. Therefore we had a second chronology partly filling the uncharted interval of time between the prehistoric timbers of Chaco Canyon and modern trees near Flagstaff and leaving two gaps shorter than before, but of unknown length. On a trip to Betatakin and Keet Seel, out in the northern Navajo country, in 1927, excellent timber specimens, which showed that they belong to the latter part of this second chronology, were obtained (see page 760).

THE PREHISTORIC GAP BETWEEN CITADEL AND PUEBLO BONITO IS BRIDGED

Thus the newly developed chronology showed that Citadel, Fewkes' Ruin J, Wupatki, Mesa Verde and Mummy Cave, Betatakin, Keet Seel, and other pre-Spanish pueblos belonged to the same general period. Between all of these and Pueblo Bonito, however, there was a gap which Mr. Judd believed to be short, but which bothered us a great deal. Finally, we checked over the records given us by a juniper and a pine and compared them with the latest rings from Pueblo Bonito,

Photograph by E. W. Haury

MODERN HOUSES STAND ON ANCIENT RUINS WHERE BEAM HH39 WAS FOUND (SEE PAGE 770)

The Mormon town of Showlow derived its name from an early-day card game. The stakes were high. One cowboy bet his all that he held the lowest card—and lost. So the spot became "Show low."

and, lo, what was a distressing gap yesterday to-day was filled in and two chronological periods were united into one (see text, page 767).

Thus, on February 3, 1928, I was able to write Mr. Judd that the gap between the Pueblo Bonito period and that of Citadel and associated ruins had been bridged, that we had more than 580 years in a continuous prehistoric sequence.

I now made an effort to discover very old trees in the hope that thereby we could link this united and extended prehistoric sequence with our modern chronology, and offered a reward for any pine 600 years old. We already had a section from a 640-year-old tree, but it had a serious injury near the center, which we did not understand then, but which we now know was caused by the great drought of 1276 to 1299. The next 100 years of that tree's life were very complacent and gave no configurations of rings that could readily be recognized.

An attempt was made to match our prehistoric pine sequence with that of the long-lived sequoias of California. This failed to give any certainty in dating, for there was no point at which the correspondence between the two stood out in a striking manner. I was compelled to renew the search for beams.

BEAMS CUT BY STONE AXES SOUGHT IN HOPI VILLAGES

As successive generations of Hopi Indians had dwelt among the mesas 100 miles north of where the Santa Fe Railroad crosses the Little Colorado River, near Winslow, we believed that here was a promising field for search. Oraibi, for instance, has long been regarded as the only one of the present Hopi villages that has been continuously occupied since a period antedating the advent of the Spaniards, in 1540. We knew that many of its logs were cut by stone axes. Some of these, we reasoned, must be very old.

Thirty years ago Oraibi, with its 900 inhabitants, was the largest of the Hopi

Photograph by Sumner W. Matteson

THE SNAKE DANCE LINE-UP AT SHONGOPOVI, HOPI RESERVATION, ARIZONA

Like the Bean Dance described on page 754, the Snake Dance is celebrated as a prayer for rain. It is based on the tradition that snakes are elder brothers of the Hopis and are more powerful than they in compelling the nature gods to bring rain.

villages; but when the rains began, after the great drought of 1880 to 1904, their farms were washed away, the underground water was lowered, and crops failed. Dissensions arose, and they felt that some of the inhabitants should leave to try their fortunes in new places. The actual division came in 1906 and was over the unrelated question of whether their children should be sent to school, as ordered from Washington.

The decision as to which party should leave was reached in a characteristically Hopi way, by a tug of war. This was held just above the present village, where an inscribed rock still marks the spot. The losing side founded the neighboring village, Hotevila, and a large part of the old town was left desolate, but it was not unowned, as we found.

WE LIVE WITH THE HOPI TO OBTAIN SPECIMEN BEAMS

We needed some one to live a month or two in Oraibi and make borings in every available old timber. Mr. L. L. Hargrave was selected. In order to command the full coöperation of the Indian chief, Tawa-Guap-Tiwa, I carried along a present of purple chiffon velvet, which was so lovely that I was afraid to show it to Mrs. Douglass for fear it would never get out to the Indian reservation. The chief's exclamations and gestures of delight on receiving the gift showed how keenly it was appreciated.

We rented two rooms in an Indian house, and the old chief, who spoke only a few words of English, called on us often. Others, whose knowledge of English was as limited as was ours of Hopi, came likewise. They were all socially inclined; smoked our cigarettes as if born to the brand and seemed to enjoy teaching us their language.

The logs sought for our dating work were all ceiling beams, originally cut to span the rooms and make floors for the rooms above. They extend through the walls and in front rooms project outside, a delight to the tourist and an example to the modern architect. We were equipped

Photograph by Sumner W. Matteson

LIVE SNAKES HELD IN THE MOUTH ARE A PART OF HOPI RITUAL

After the ceremonial the dancers purify themselves. Oraibi, Arizona, the scene of this dance, has been occupied by Indians since pre-Spanish times.

with a saw to cut cross-sections from the projecting ends of these logs and a tubular borer to drill out cores from the timbers within doors.

We went at once to the abandoned Kwan Kiva, at the southeast edge of town, and bored all the logs in sight, only to find that many were of cottonwood or juniper, which were almost useless for our purpose. Eventually we realized that the much-desired older logs were generally of pine and Douglas fir, whose rings are the best of all. After dating numerous sections, we discovered that the use of these trees ceased about A. D. 1770. Evidently by that time all the available trees within portable distance had been cut down. Thus we learned something of the injurious effects of human occupation on forests.

TURQUOISE APPEASES THE "SPIRIT OF DECAY"

Ends cut with a stone ax then became the distinguishing character. Small chips taken off showed whether the rings had the strong marking of pine or fir, the weak lines of cottonwood, or the narrow, erratic lines of juniper. Length also helped in the selection. Pre-Spanish beams used in the dwellings are rarely more than eight feet long. Spanish beams are easily twice that and are nearly always found in the kivas, or ceremonial chambers.

We call them "Spanish" because these timbers were salvaged by the Hopi when they destroyed the missions, in 1680; they have been in use ever since, and tradition has it they were originally carried by Indians on foot, mostly from the San Francisco Mountains. There are probably a few long pre-Spanish beams still in use.

At times in our beam gathering we had to appease the spirits for the Indians by inserting a piece of turquoise at the base of the plug with which we filled the hole made by the extraction of a core. This was to prevent the lodgment of the "spirit of decay" in the timber (see page 738).

A rounded log in the Antelope Kiva at Oraibi gave the year 1475 as its outermost ring, and the outside wearing, which at first I thought was intentional, later became recognized as invariable in the

Photograph by Hugh Stevens Bell

OLD WALPI CELEBRATES FOLLOWING A CEREMONIAL DANCE

For three days after the dance, anything a man holds above his head is a present for the first woman who can seize it. The women believe in teamwork, and the contests which they stage are less gentle than football (see, also, illustrations, pages 752, 753, and 755).

oldest logs. It was cut about 1520. Also, a specimen from Moong Kiva, at Walpi, appeared to be nearly complete, and its outside rings gave 1490 as its cutting date. Ladder poles were more recent. One ladder showed one pole cut in 1570 and the other in 1720, which reveals a story of breakage and repair.

WE FIND A BEAM USED FOR 500 YEARS

Naturally I wanted the oldest log. The oldest we found was in that section of Oraibi abandoned in 1906. We entered on the second floor of a three-story house, over a terrace consisting of older rooms filled with rubbish. We went through several chambers and entered into a part of the structure still in good condition. Mr. Hargrave lifted a flat stone on the floor, revealing a hole into the room below.

I swung down a couple of feet onto a rubbish heap made of the sandy sweepings of years from the room above. This had been covered with a thin floor of clay to make a small storeroom some eight feet square and three feet high. With a flashlight I could look around.

In the center was an upright post, not more than six inches in greatest diameter, supporting the center of the ceiling. It was partly flattened, and as it was holding up the floor of the room above, no cross-section could be taken, but its longer diameter was bored by Mr. Hargrave. The rings of this beam gave a superb series from 1260 to 1344 (see illustration, page 760). Allowing for wearing, it was probably cut as early as A. D. 1370 and had been in use continuously for well over 500 years. The whole log, six feet in length, was finally obtained on August 7, 1929, and is now safely preserved in my laboratory at Tucson. Other timbers, perhaps equally old, are rapidly being broken up by the Indians for fuel.

A BEAN DANCE TO BRING RAIN

Kivas are subterranean ceremonial rooms. One of the best is known as the Moong Kiva, at Oraibi. It is some-

Photograph by Hugh Stevens Bell

HOPI INDIANS SKYLARKING AFTER A WOMEN'S DANCE

The whole village turns out to see the fun, as maidens corner a defiant brave and reduce him to submission, after he has had the audacity to walk down the street with a prize held above his head (see, also, illustration on opposite page).

what larger than the others and is used for more general gatherings.

Our friend, Chief Tawa-Guap-Tiwa, was directly in charge of it. He said, "Are you going to be here to-morrow night?" I had a fleeting thought that he was going to say sternly, "Perhaps you had better not be here." But, on the contrary, he said that there would be a final practice of the Bean Dance from about 8 in the evening to 12. We were invited to take part in the rehearsal.

At 8:15 we heard the big drum, went down the ladder, and took our seats on the bench. The chief's father sat near by, smoking native tobacco in a stone pipe; other participants smoked cornhusk cigarettes. A small cast-iron stove and an ordinary kerosene lamp seemed altogether out of place at this old Hopi ritual. After modest hesitation, Mr. Hargrave accepted the chief's invitation to enter the dance, and for an hour ably represented our party.

Twenty men formed a semicircle in the large end of the kiva face to back. As the chief beat time on the great drum the Indians chanted their prayer. Within the semicircle sat an older man, who from time to time threw in a word or two.

The men in the semicircle represented the spirits of the rain, who dwell 100 miles away, in the great cloud-covered San Francisco Mountains, near Flagstaff. The man in the center was the Father of the Gods.

The spirits of the rain were saying in effect, "Our brothers in Oraibi are ready to plant their beans. They need rain, so that the beans will grow and supply food for themselves and their families." Then the Father of the Gods calls out, "Yes, let's go and help them."

As I sat watching the dance, I realized that I was one of three terms in a human series: First, the Indians of a neighboring village, who believe that rain is actually controlled by proper magic, performed by their powerful priests; then those before me, who were praying to the more powerful spirits that rule the rain; and, lastly, I, myself, who was there to study the rainfall history in pine timbers

Photograph by Dr. A. E. Douglass

STUDYING BITS OF TELLTALE CHARCOAL UNDER MAGNIFYING GLASSES

and learn the great natural laws which govern the coming of the rain. We were all doing exactly the same thing according to our lights.

INDIAN MASKS MADE FROM OLD FELT HATS

In the old days, kivas were rarely opened to strangers. Close collusion with the priests who had them in charge was necessary. On one occasion Mr. Hargrave sent me a core drilled from a large roof beam. It was only two and a half inches long and clearly did not go to the center of that timber. I asked him to try to obtain the remaining section of it on his next trip. He explained that the reason he did not complete the extraction of the core was that some of the Indians had raised objections to his work in that kiva, and he had been obliged to stop.

I discussed the subject with Chief Tawa-Guap-Tiwa upon my next visit, but he rather evaded the point, and we did not get the remainder of that specimen. I learned, however, that the Bean Dance was coming soon and that old felt hats were needed. I visited a number of friends, collected twenty old ones, and carried them back to Oraibi as a present.

From old felt hats masks can be made, and the gift was very much appreciated. The Indians sewed the brims in a vertical position, made holes for the eyes, and painted noses and mouths. They built up the tops of the hats into very elaborate ceremonial headdresses and painted them in gorgeous colors. These they showed me with great pride.

Another gift that brought us good will was a present of six turtles. From turtle shells rattles are made and worn around the right leg in ceremonials. We gave the turtles to the important men and then had a conference with the chief of the Ha-Wi-A-Wi clan, in whose village stood the beam whose boring we wanted to complete. I asked him if he would permit us to continue that boring and perhaps to bore one or two other logs. He said he was very sorry, but that the boring would endanger the roof of the kiva. I told him that I knew he was protecting the interests of his people, and especially those who owned and assembled in the kiva, and I would be guided by his judgment.

He answered that white people rarely or never showed that consideration or understanding of the interests of the Indians. Later he gave his consent for us to go outside the kiva and dig down in the ground until the end of this beam was exposed. There we could find out if it were of value. When we did so we found nothing that would add to our chronology.

Meanwhile, we discovered in the floor some planks which looked old and we obtained permission to examine them. Using a gasoline lamp, I spent most of the time from 5 o'clock in the afternoon until midnight lying flat on the floor, with a lens in my eye, my nose almost touching the boards, counting and measuring the rings in those planks. The only success that those seven hours brought us was to discover from the outer rings of the fourth board that all had grown between the great drought of 1580 and the familiar Spanish dates of about 1640.

Photograph by Neil M. Judd

A NAVAJO WOMAN AND HER PAPOOSE AT PUEBLO BONITO

To the Indians of the Southwest the successful reading of the tree rings in the beams of their old ruins seems as uncanny as foretelling an eclipse of the sun.

INDIAN WOMEN PROVE A STUMBLING BLOCK

In the acquisition of beam material women were always more difficult to deal with than the men. At Walpi we found one kiva near the south end of the mesa which had at least ten good logs. We hunted up the priest of the kiva and his handsome son. We discussed our needs in front of their house. Presently we discovered that a woman of the household was listening just inside the window, and every once in a while was urging the Indians to charge "everything that traffic would bear."

So our interpreter suggested that we go to the kiva and talk. There we informed the chief of our customary price for each log that we bored; but that, as this was a kiva and as the logs were larger than usual, we would pay double the usual sum. They replied that since this was a most sacred spot and the god himself dwelt in a niche which we could see, they would have to charge four times our regular

Photograph by Sumner W. Matteson

A PLAQUE WEAVER OF MISHONGNOVI

She is wearing a silver necklace of squash-bloom pattern. Near the Hopi pueblo of Mishongnovi, in Arizona, are two sandstone pillars. One has fallen. The name means "at the place of the other which stands erect." This pueblo was searched for old timbers, but produced none of special significance.

price. All I could see in that abode of the god was a handful of prayer sticks.

Finally we reached a compromise, and if we had made our borings at once all would have been well. But we did not have our instruments with us at the time. Several days later some one had raised an objection to our boring those particular logs and we were not permitted to touch a single one.

HOPI PUEBLOS BUILT ABOUT 1400

We looked through Shipaulovi and Mishongnovi without finding many promising specimens. We also visited the three villages close together on the first mesa: Walpi at the southern end, Hano at the center, and Sichomovi at the northern end of the shoestring. The inhabitants of these villages had all moved to the high mesas after the rebellion of 1680.

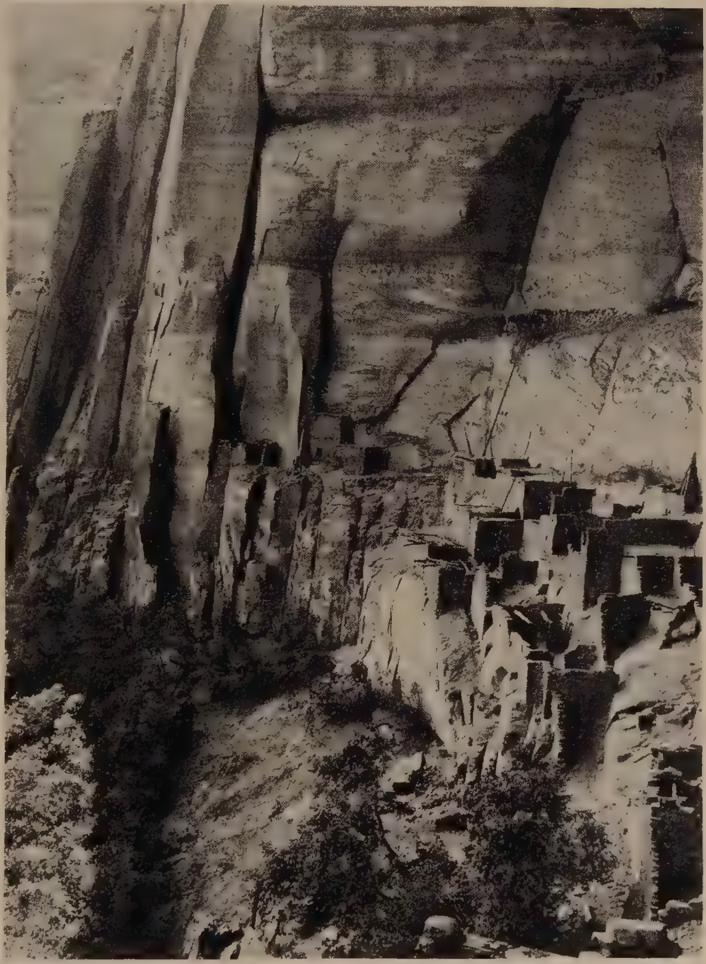
We found that the Government had recently brought in a large number of fresh spruce logs from the Black Mesa, 40 miles away, and the Indians had used these to rebuild their kivas and had cut up the wonderful old Spanish logs and beams for firewood. Hence the dozen specimens from Walpi gave no new information, and there is little prospect of more in the future.

After making large collections from old Oraibi and from Shongopovi and seeing a few specimens from the other villages, it seemed to me fairly evident that we would gain nothing by further search in the Hopi villages. The earliest cutting date discovered was close to the year 1400. One or two logs could be interpreted as having been cut a little before that, but after all our effort no additional piece was found whose inner rings began earlier than 1300. The inference seemed obvious; the pueblos abandoned following the revolt of 1680, when the Hopi erected their present villages, were built about 1400; in the case of Oraibi, alone, the original site has been occupied ever since.

Thus the early work of 1928 indicated that available Hopi beams were not sufficiently old to link definitely our two tree-ring chronologies (see page 769). The question was, Where should we next look for some older locality whose building period preceded that of Oraibi—in short, the locality from which the Hopi Indians had last migrated?

FRAGMENTS OF POTTERY PROVIDE A PRICELESS CLUE

To answer this question a survey was made of that area known archeologically to have been inhabited by the Hopis in pre-Spanish times. Fragments of pottery were collected at each important ruin; from the shards a sequence of development was obvious. Black-on-white and a form of red ware began in very old times. Then the red changed into a polychrome-on-red. Later the beautiful yellow Hopi pottery began to appear. The development continued with improving fineness of decoration until interrupted by the Spanish influence. Then pottery-making fell into a decline which lasted until about 1897, when Nampeyo (see illustration, page 742) saw her opportunity to inspire a revival of the art.



Photograph by Neil M. Judd

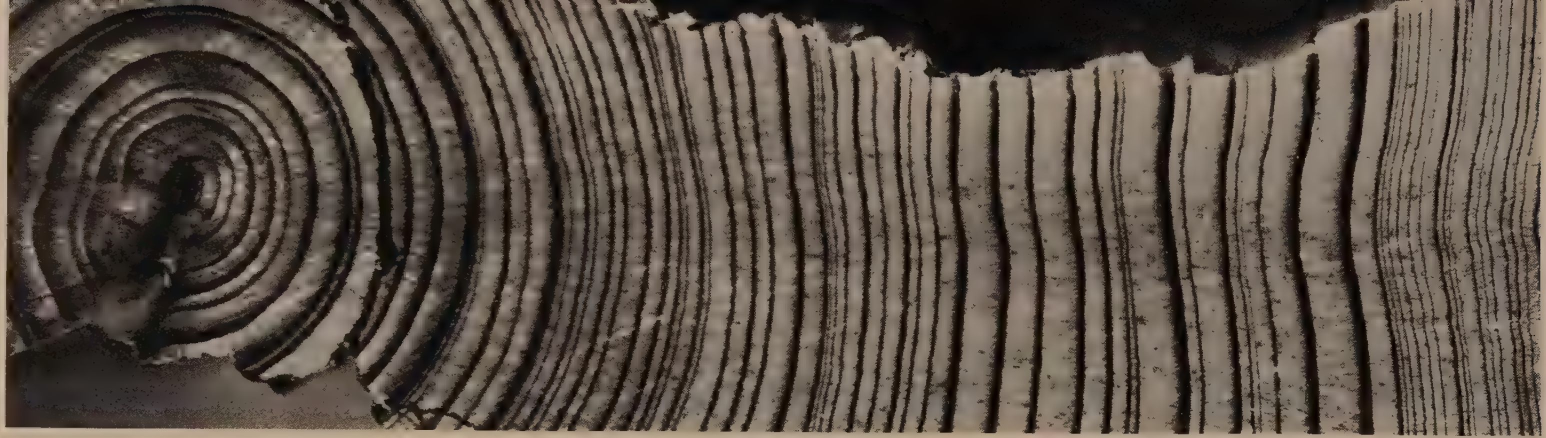
BETATAKIN, IN THE CANYON COUNTRY OF THE NAVAJOS

To this old stronghold of vanished cliff-dwellers, restored by Mr. Neil M. Judd in 1917, beam hunters went in quest of tree-ring testimony. The ruins yielded timbers which showed that Betatakin was occupied as early as 1260 (see upper illustration, page 760).

The relationship between the latter years of the prehistoric and the earlier years of the historic chronologies to this sequence of pottery types was easy to determine. Pueblo Bonito, in New Mexico; Keet Seel, near the northern border of Arizona; and Turkey Hill Pueblo, near Flagstaff, had given final building dates covering the late prehistoric chronology. Their pottery, therefore, would necessarily belong to the prehistoric period. It had not developed beyond a polychrome-on-red. But Kawaiku, which has given numerous historic building dates from 1357 to 1495, showed not only polychrome-on-red but, in addition, Hopi yellow ware in great abundance, with both primitive and late designs.

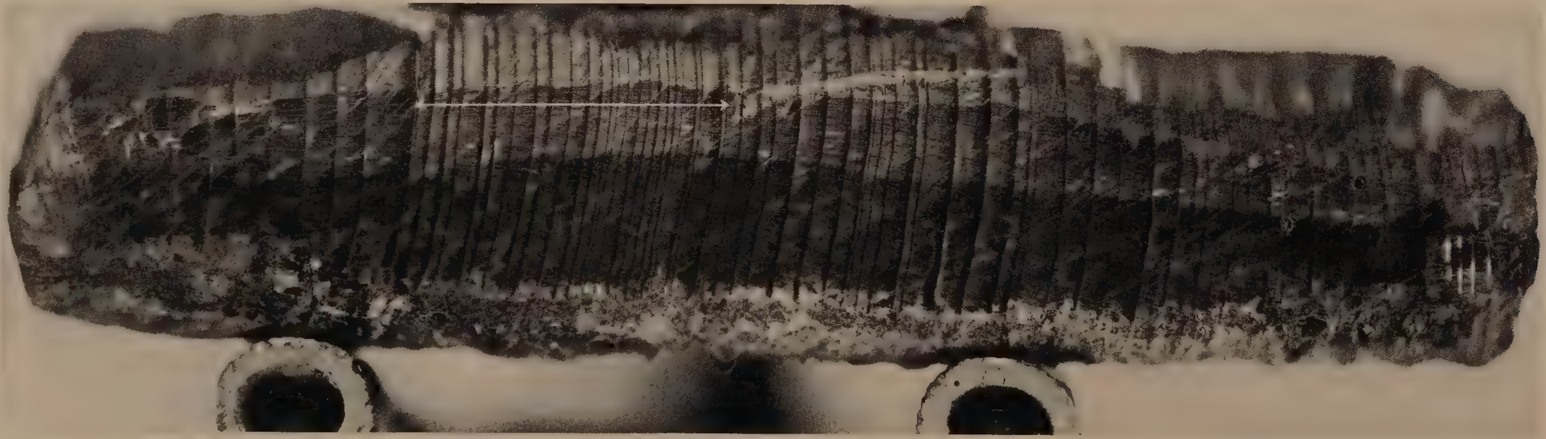
Evidently the point where the two sequences could be joined was close to the latest use of polychrome-on-red and the earliest development of Hopi yellow.

Not until the preliminary work of 1929 did we recognize that a transition orange color, which could be depended on as



A CROSS-SECTION OF A DOUGLAS FIR LOG THAT HELPED MAKE HISTORY

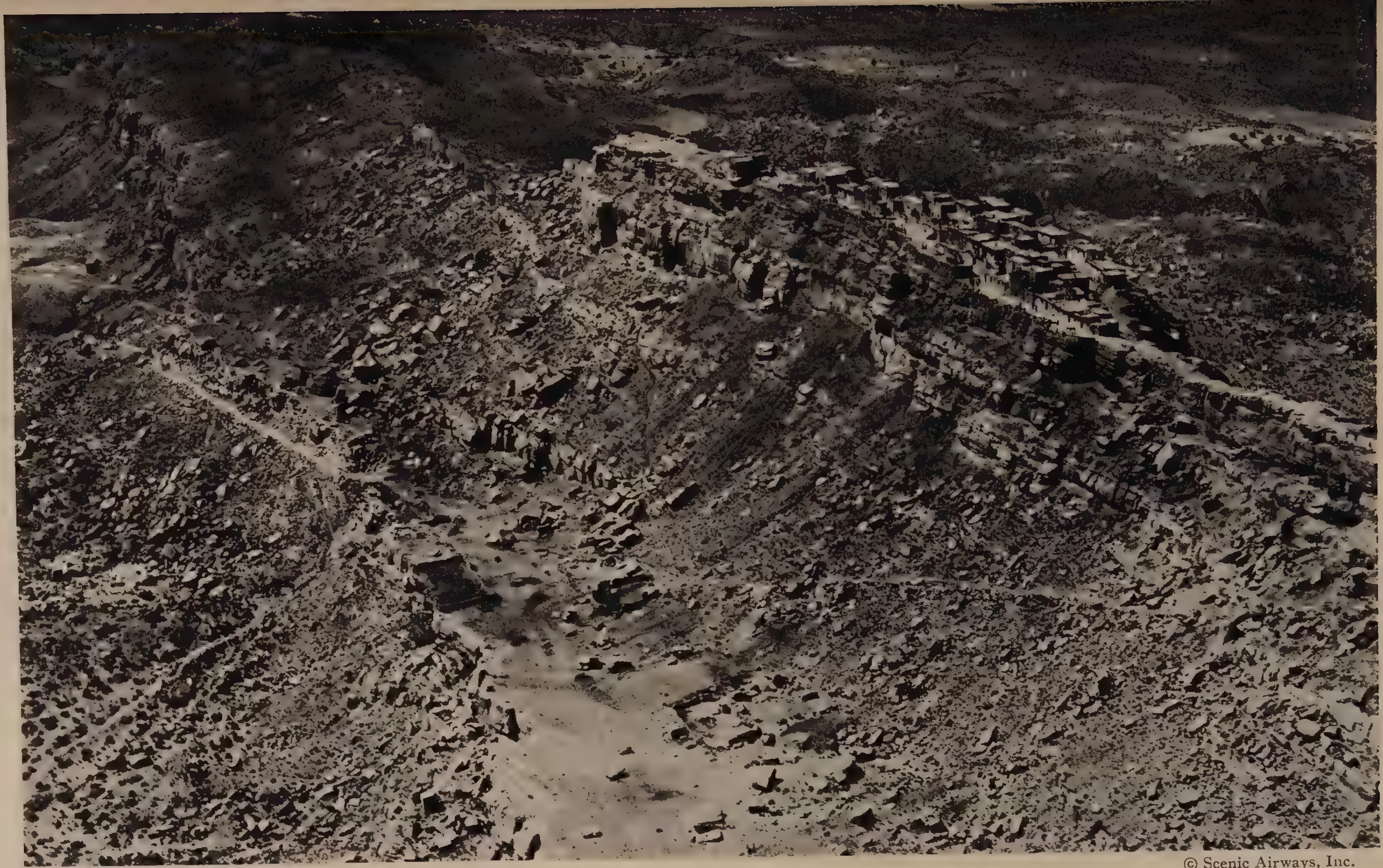
In the search for beams that would tie together the tree-ring stories of Pueblo Bonito timbers and those of living trees, this one found in Betatakin Ruin (see text, page 750, and illustration, page 759), proved to be a missing link that bound the 586 years of the prehistoric chronology together. Its rings show that it started its career in 1073 and was felled A. D. 1260



Photographs by Dr. E. F. Carpenter

A TIMBER TALE OF FAT YEARS AND LEAN

This is an enlargement of a 3½-inch core cross-section of a beam taken from the old house at Oraibi (see, also, illustration, page 746). In the thin group of rings at the left center is revealed the story of the tree's hardships during the great drought between 1276 and 1299 (see text, pages 742 and 754).



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FAR UP ON THESE CLIFFS OF NORTHERN ARIZONA THE HOPIS LONG AGO BUILT THEIR TOWN OF WALPI, STRATEGICALLY LOCATED FOR DEFENSE (SEE, ALSO, PAGES 744 AND 745)

Walpi means "the place of the notch." The ancestral Hopi clans who first settled here built their homes below the site of the present village.

Photograph by J. C. Clarke

EXTRACTING A CORE FROM A LOG AT WUPATKI

When impracticable to cut a cross-section from a log, the necessary data which its tree rings record can be obtained by drilling the beam and removing the core (see page 760).

pottery of the linking era, came between the red and the yellow. This was an important guide in the selection of ruins for our subsequent search.

A BIT OF CHARCOAL GIVES A VALUABLE DATE

When I first became interested in the possibility of dating prehistoric ruins through tree rings I was very particular as to the specimens worth looking at. I told the archeologists that only pine beams six inches or more in diameter and in good condition could be used, and it is true a large number of first-class specimens enriched our collections. Then, to extend the known chronology, specimens were accepted in poor condition.

But many of the sections from Pueblo Bonito were burned; we had to find a way successfully to treat charcoal. At first frail specimens were dipped in melted paraffin. Later, this method was improved upon: the fragments were soaked in a solution of paraffin and gasoline. This solution we now keep on hand, and fragile pieces are immersed in it as soon as they come out of the ground, or, if not, they are kept covered by fresh earth until they can be put in the solution. If the pieces are apt to fall apart they are tied with string and then soaked.

The first specimens from the Jadito Valley ruins were mere chips scratched from old débris heaps near the mesa edge. These were brought to me with misgivings, for many were only as large as one's thumb, and a little pressure would crush them to powder. But, to my surprise, we found in some bits a series of rings closely resembling those between A. D. 1365 and 1420. These pieces came from Kawaiku.

I attached a high degree of importance to this dating, and yet refused to rely upon it completely because too much depended on it; for, if correct, it would be the first pre-Spanish ruin in the southwestern United States to receive an actual and exact date.

Absolute certainty was finally obtained in a piece of charcoal as big as one's fist, found in an old kiva at Kawaiku. The rings looked favorable; we carefully bound the fragment and soaked it in the paraffin

Photograph by Dr. A. E. Douglass

THE FIRST BEAM EXPEDITION FINDS A TALKATIVE TIMBER

From this modern house at Sichomovi beam hunters took a specimen whose tree rings show that it was cut by Indians nearly 100 years before Columbus reached the New World.

solution. Subsequent examination showed that the rings could be followed from center to outside, and they gave an absolutely perfect sequence from 1400 to 1468, as reliable as if they had been dated at the time and sworn to before a notary. This established conclusively the correctness of all the other dates which had been obtained of approximately that same period.

KAWAIKU OCCUPIED BOTH IN HISTORIC AND PREHISTORIC TIMES

Then other specimens came to light, carrying our ring sequence back to 1300 and forward to 1495, and showing that new dwellings were erected in this village shortly before the first Spaniards, Pedro de Tobar and Fray Juan de Padilla, reached Awatobi in 1540.

A group of wood fragments in another place showed a series of cutting dates from 1357 to near 1400. At the same time, a bit of pine built into the wall as a door lintel gave a very dependable late prehistoric date for the original walls.

Thus we had ample evidence that Kawaiku was occupied both in the latter years of our prehistoric sequence and the earlier years of our historic chronology. Hence this ruin, or one of its neighbors, gave promise of being a desirable site in which to search for those particular rings that might unite the two series. No doubt the desired wood was here, but the ruin covered some nine acres and it would be difficult to say where that wood could be found.

We were far from discouraged when our second expedition closed without having contributed any appreciable results toward the linking of our two chronologies. The one Oraibi specimen (see text, page 754), whose center was at A. D. 1260, was of the utmost importance, but it was all alone and covered a period of time from which surviving timbers were few and usually badly defective. Yet the prospect of ultimate success in tying them together seemed brighter than ever! By the spring of 1929 we were convinced that our pottery sequence could be used as a reliable guide in finding ruins of the desired period.

Of course, the question arose: Could the needed specimens even now be on our shelves? An illustration of how unsuspected treasures may pass unregarded, even in the ring student's laboratory, is afforded by an incident of the preceding year. On my first visit to the National Geographic Society's excavations at Pueblo Bonito, in 1922, Mr. Judd gave me, among other pieces, a very fine section from a horizontal wooden base supporting a ceiling log in one of the large kivas. At that time the specimen disclosed nothing I could recognize. I put the whole group of 15 specimens to one side, as not revealing anything of importance.

Five years later I undertook a reëxamination of them in the light of some other material with which I was working. Then it was that this section of the horizontal wood base became eloquent with its story. It covered an entirely new century and extended the prehistoric chronology backward 107 years. It showed that the tree from which it was derived had been cut when it was approximately 337 years old.

Recollecting this case, I repeatedly examined all material that might help unite the two chronologies, but failed to discover anything not previously disclosed.

WUPATKI AND PUEBLO BONITO BUILT WITHIN 70 YEARS OF EACH OTHER

That the conclusions of competent archeologists were dependable as to the probable decades in which the two sections of our calendar would join may be illustrated by another experience. About 35 miles northeast of Flagstaff there is a fine old ruin known as Wupatki. I asked one of my archeological friends his opinion as to the relative ages of that ruin and of Pueblo Bonito. He replied that such evidence as he had examined indicated that they were of approximately the same age. When I examined timbers from the two ruins in my laboratory and applied the usual methods of dating, I found that the old village on the slope of San Francisco Mountain, in Arizona, showed a building date only 70 years after those of the more famous pueblo in Chaco Canyon, New Mexico, 220 miles away.

What then was the next step? We had identified a locality in the Jadito Valley which was apparently inhabited during portions of our two time periods and presumably through the years that linked them together. Other Jadito ruins, especially Kokopnyama, seemed favorable and equally likely to contain material covering this period. But each of these ruins was nearly ten acres in extent and we were without any means of knowing just where to dig.

Probably beams at a depth of 10 feet or more were in good condition, but a search for them would mean deep, long-continued excavation. Nearer the surface, timber of the age which we desired would be badly decomposed unless previously burned by fire. Hence evidence of rooms destroyed by fire was the essential clue in future work. Several of the ruins south of Holbrook gave indications of being near the right age and were in the midst of the pine forest. Their colder climate and the abundance of freely burning wood made charcoal far more likely to be found there in quantity.

SHOWLOW RUIN OFFERS BRIGHT PROSPECTS

These considerations provided a background on which to plan the third expedition. In the early spring of 1929 a reconnaissance was made of the pre-Spanish Hopi region where orange-colored pottery or its imitations were found. After excluding wonderfully interesting sites along the Little Colorado River, four ruins—Kokopnyama, in the Jadito Valley; Kintyel or Wide Ruin, to the southeast; Showlow and Pinedale, 100 miles south, in the great pine forest of the Mogollon Rim—were selected for examination.

Of these, the Showlow and Pinedale ruins made the stronger appeal because of their proximity to growing pines. Even between these two, first choice went to Showlow because from it pieces of charred wood had already been reported. When a fire occurred in this communal dwelling and some of the ceiling beams began to burn, the walls evidently collapsed and smothered the flames, thus converting some of the timbers into charcoal which has resisted decay.

This wood was finally examined in the new laboratory of the Association for Research of the Southwest, by courtesy of Mr. Harold S. Gladwin, Director, and clearly pointed toward Showlow as the place where the material should be found which would unite our chronologies.

Mr. Hargrave and Mr. Emil W. Haury left Flagstaff on June 11 to begin work at the Showlow ruin, while I remained behind to set up a temporary laboratory in quarters which Dr. Harold S. Colton, the Director of the Museum of Northern Arizona, kindly placed at my disposal.

Help was obtained for unpacking and dipping the specimens in liquid paraffin as they came in. Material arrived rapidly from the Showlow party. Among the first important specimens were portions of several logs, in the form of charcoal, of course, which showed dates in both the historic and the prehistoric series.

A NOTABLE FIND IN THE MIDST OF A RUBBISH HEAP

Photograph by O. C. Havens

CHARLIE PINTO, A ZUÑI WORKMAN AT PUEBLO BONITO

The Zuñi tribesmen have been capable assistants on the National Geographic Society's numerous expeditions in the Southwest. They are good-natured, quiet, and industrious and strict conformists to their ancient religion.

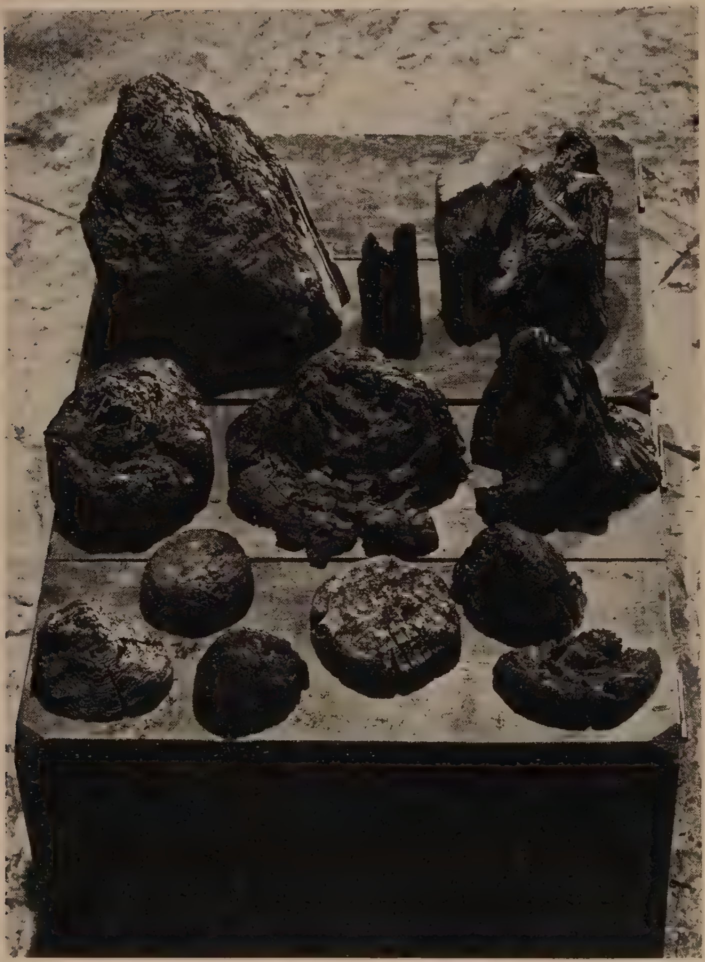
After getting the ring sequence from those logs, Mr. Judd and I left Flagstaff early Saturday morning, June 22, for Showlow. When we arrived there, shortly before noon, we found that another log had just been discovered at the extreme north end of the ruin. It had been found only a foot below the present level of the ground, in an area, however, from which earth had been removed in recent years.

The general area in which the men were working is one where modern things intermingle with ancient ones. There are 20th-century houses, cisterns and stone walls, barns, chicken yards, and fences covering the site of what remains of the prehistoric buildings, most of which were razed many years ago.

Furthermore, Mr. Edson Whipple, who owns the larger part of the property, had overturned every room in the old village in his search for primitive pottery and the extension of his gardens over leveled masonry and crumbled walls.

Our men, therefore, in their search for fragments of charred beams, found at every turn the discards of 19th and 20th century culture—here a piece of packing box, there a beef bone with sawed ends, and elsewhere a broken pickle bottle or the top of an old tin can.

But it was easy to note the difference between prehistoric wood and modern fragments. The old timbers had disappeared entirely except in the form of charcoal or near-charcoal. Some of the frag-



Photograph by Dr. A. E. Douglass

ANCIENT STONE AXES CHOPPED THESE ROUGH BEAM ENDS

The work of estimating the age of beams is often expedited by examining their ends. From Mexican traders of the 17th and early 18th centuries, the Hopis acquired sharp-bladed metal axes and soon many Indians forsook their dull stone implements and acquired the white man's tool. These beam ends—natural wood, not charcoal—reveal the dull, mashing blow of the thick-edged primitive stone ax.

ments we recovered had, in their charred form, survived the centuries, but still showed that they had been patiently worked smooth with sandstone rasps by Indians of the long ago.

BEAM HH39 PROVES TO BE THE LONG-SOUGHT KEY

But among the valuable material we found at Showlow first place must go to the log taken out just after Mr. Judd and I arrived. It was found in a horizontal position and resembled an ordinary round beam which had been burnt off at the end in the form of a cone, as is common with burnt logs.

As a precautionary measure for holding it together, we bound it carefully with cotton twine; but, even so, the specimen fell to pieces, and not until then did we discover that our supposedly solid log was merely a conical shell of charcoal and near-charcoal from which most of the wood untouched by fire had decayed.

But, for all that, it was clearly a fragment of exceptional value. We gave it the field number HH39 (see illustration, page 769), after which I commandeered Mr. Whipple's old tool house and spent most of the afternoon working on it there.

Its outer parts were at once recognized as belonging to the 14th century, rings being traceable nearly to A.D. 1380. The record it gave us after 1300 was absolutely satisfactory, with no question whatsoever remaining as to the dating.

Following its rings inward to the core, we saw the record of the great drought. Here were the very small rings that told of the hardships the tree had endured in 1299 and 1295. As we studied the rings further toward the center, 1288, 1286, 1283, and 1280 each told the same story we had found in other beams of lean years and hard living. Also, there were the years 1278, 1276, and 1275, the ring for each corroborating the diary entries other logs had given us.

Then came the years of the seventh

decade of the 13th century, and the stories told by their rings agreed in every detail with those told by the rings for the same years in the Oraibi beam (see text, page 754).

But whereas the Oraibi beam could tell us nothing back of 1260, Showlow's HH39 did not stop there. Here was its account of 1258, a hard year, and of 1254, an even harder one. Presently it told of 1251 and 1247, years when all the trees were singing "How dry I am."

We were getting down close to the center now. But the rings were clear and easily understood. Finally came the one at the very core, and from its central ring (see illustration, page 769) we learned that this charred old stick began its life as a promising upright pine A. D. 1237, just ten years after the Sixth Crusade moved eastward to compel the Saracens to restore Jerusalem.

NOT A GAP BUT A BRIDGE

The history within that carbonized bit of beam held us spellbound; its significance found us all but speechless; we tried to joke about it, but failed miserably. We felt that here was the tie that would bind our old chronology to our new and bring before us undreamed-of historic horizons.

Later that evening we gathered under the spluttering old gasoline torch in the village hotel, and beneath its flickering light, by the use of my skeleton plots of prehistoric tree rings, we began to determine whether our historical chronology, now extended back from 1260 to 1237 by Beam HH39, might not overlap the old chronology.

As we studied these rings the answer came. The ring in our old chronology that represented its 551st year matched perfectly with that of the ring for the year 1251 in Beam HH39. And then our big surprise! We had not a gap to bridge, as we had thought, but one we had closed without knowing it!

Our two chronologies had covered an overlapping period. But those rings of the old series which overlapped the new at 1260 had been gathered from such small fragments that I had never been willing to accept their evidence as to this overlapping. To be sure, I had dwelt upon this possibility at times, but always rejected it as unconvincing. It was Beam HH39 that cleared away all doubt.

Even after our evening's study I wanted to make further examination of one or two rings at the uncertain extremes of my two chronologies; but to my colleagues I declared that the coincidences were so striking and the situation looked so cheerful that, at such a late hour, we could well afford to sleep upon it.

But I could not sleep. Lying awake, I visualized all the individual rings concerned in this agreement and became completely satisfied that the relationship between our prehistoric and historic ring records had been definitely ascertained.

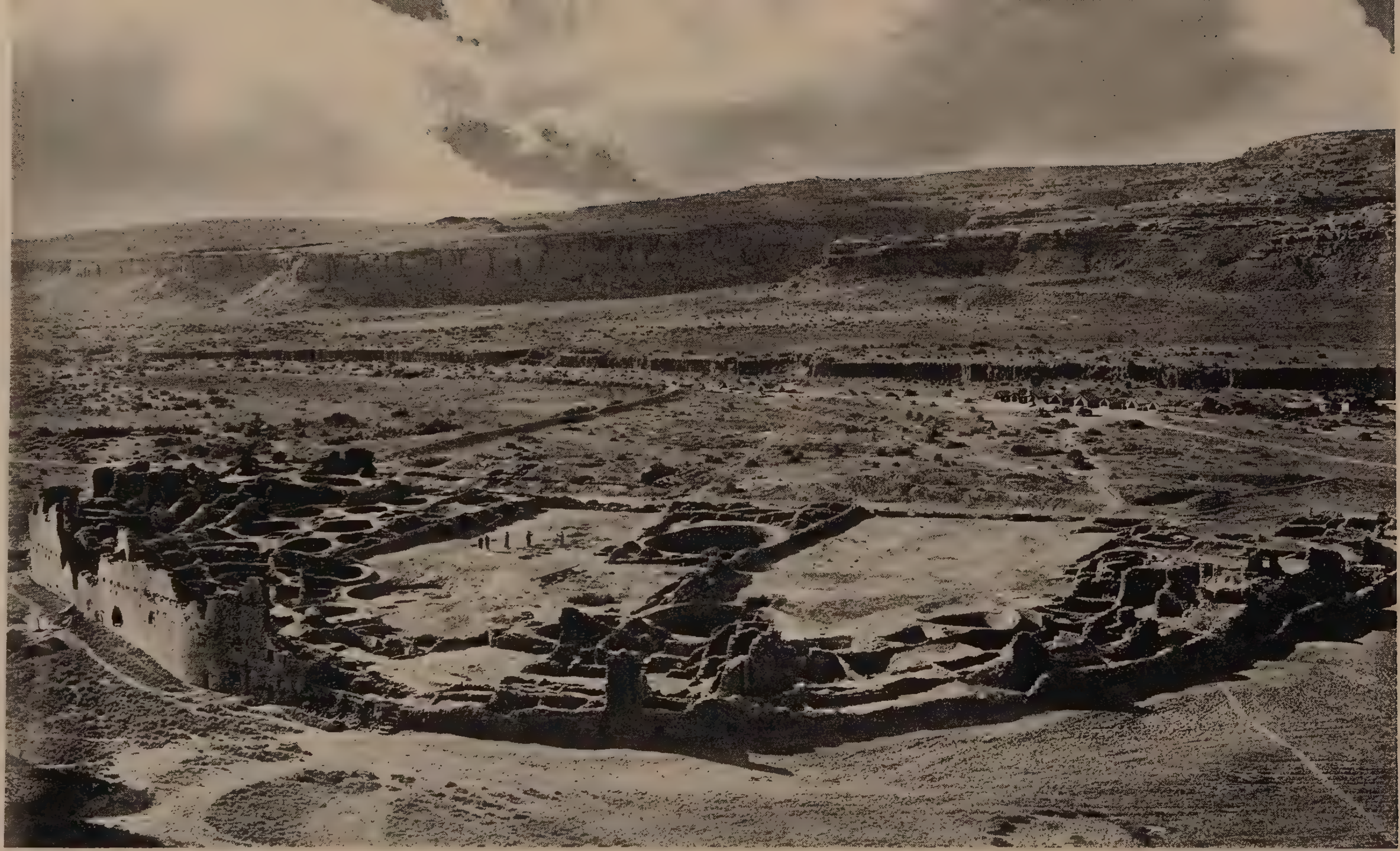
It still remained to examine with even further care the rings recording the great drought in the late years of the 13th century to see if by any chance anything had been overlooked. It would be necessary to prepare a complete photographic record of rings from the beginning of Pueblo Bonito chronology down to the present time; also, a complete review must be made of some 5,000 beam fragments, charred and otherwise, to get the various building periods in the 40 ruins from which they had come.

PUEBLO BONITO REACHED ITS HEYDAY IN 1067

But when I finally went to sleep it was with the consciousness that my old chronology had begun A. D. 700; that the earliest beam we had recovered from Pueblo Bonito had been cut A. D. 919 from a tree that was 219 years old when cut; that Pueblo Bonito had reached its golden age in 1067 and was still occupied in 1127.

The next morning I returned to our beams. More deliberate study added new strength to their story. The years between 1260 and 1295, the earliest in the historic chronology, had been dated by the Oraibi log alone; likewise the late years of the prehistoric sequence had many defective rings in the great drought period which ended it. It had been the uncertainties arising out of these conditions that had made impossible the determination of the overlap without additional beam material.

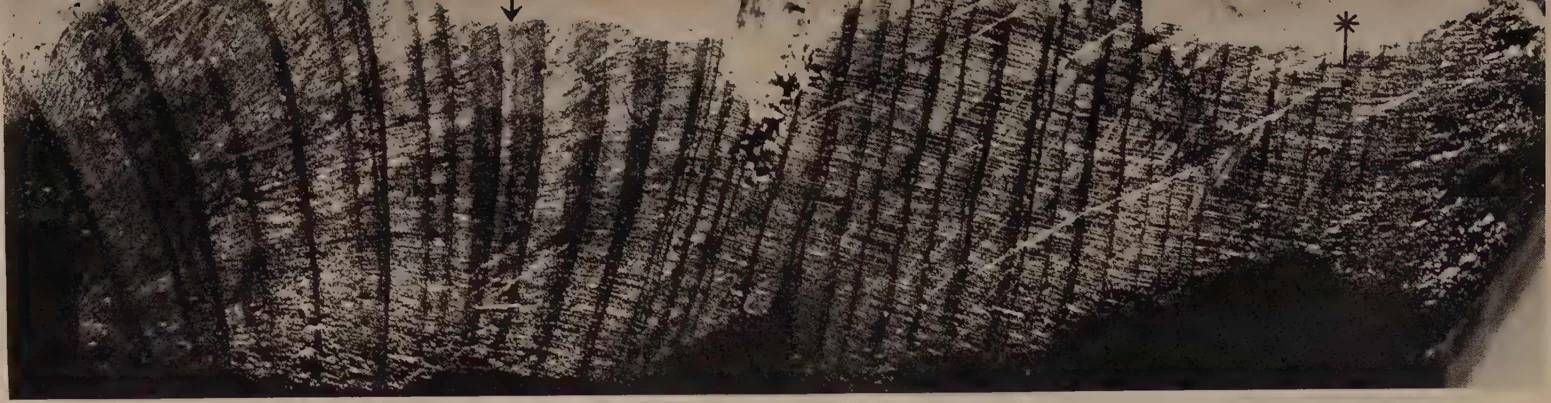
But when we found Beam HH39 it proved to be the bridge over which we could pass the deep chasm of remaining



Photograph by O. C. Havens

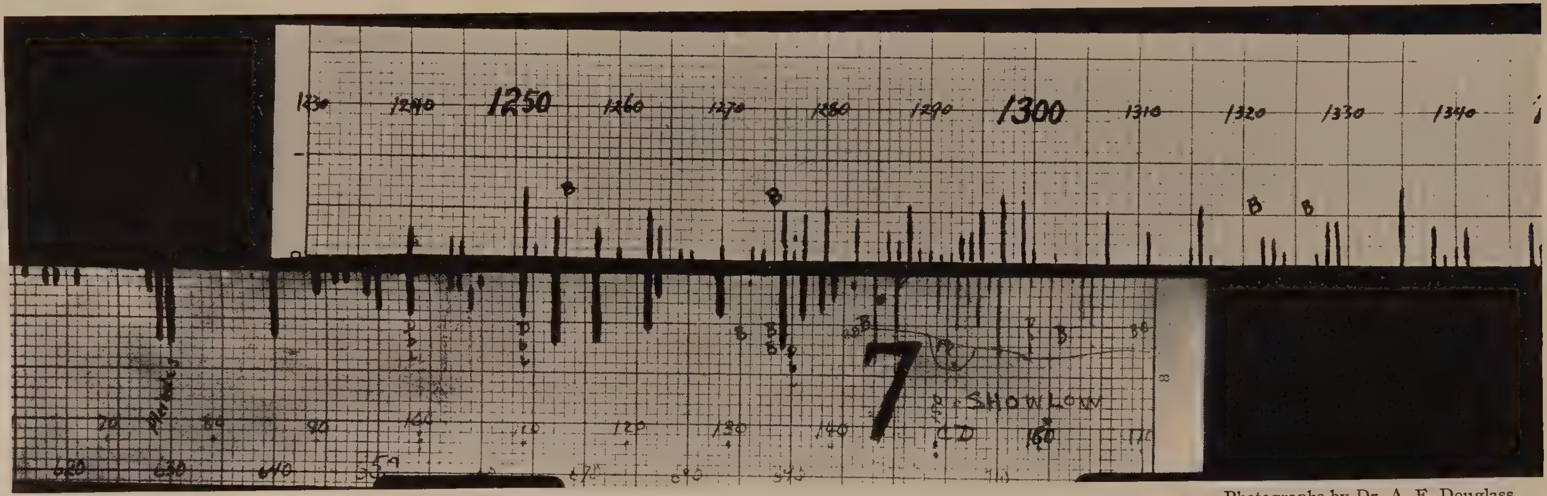
A PANORAMIC VIEW OF PUEBLO BONITO, EXCAVATED BY NATIONAL GEOGRAPHIC SOCIETY EXPEDITIONS

These ruins, set apart as the Chaco Canyon National Monument by President Roosevelt, are the oldest definitely dated pueblo remains in the American Southwest. The colossal communal dwelling was under construction in 919 and the settlement had reached its heyday in 1067 (see text, page 767).



THE KEY TO THE SECRET OF THE SOUTHWEST—CHARRED RINGS OF BEAM HH39 (SEE TEXT, PAGES 767-770)

This fragment, photographed in reflected light, shows some of the pre-Columbian tree diary entries. The ring indicated by the arrow records rainfall conditions in 1247; the one designated by a star tells of conditions in 1275. The closeness with which timbers of the same age corroborate each other's testimony about common experiences would delight a trial lawyer's heart.



Photographs by Dr. A. E. Douglass

MATCHING THE STORIES THE TREE RINGS TOLD

To make them readily accessible for comparison, one with another, each tree-ring specimen was carefully plotted. The long black lines on these original field records represent severe drought years; the shorter ones, less severe drought years. The lower plot, of specimen HH39 (see above) from Showlow brought joy to the expedition members when its principal drought years were found to coincide with those in the upper plot, made up of timber

Photograph by Neil M. Judd

THE RESCUE OF THE "ROSETTA STONE" OF AMERICAN ARCHEOLOGY

The end of Beam HH39, found at Showlow Ruin, was carefully wrapped with twine until the whole charred log could be uncovered and taken out (see text, page 766).

uncertainty. Its respective ends, figuratively speaking, rested upon staunch abutments in both the old and the new sequences.

Its inner rings overlapped the late decades of the old chronology by 49 years, the final ring resting on the year 537 of that sequence; its outer ones overlapped the earliest 120 years of the new, the last one reaching to 1380.

Thus the 26 years from 1260 to 1286, which had belonged to both chronologies, were definitely matched and their union confirmed by Beam HH39, which in American archeology is destined to hold a place comparable to Egypt's Rosetta Stone.

The successful dating of the many ruins of the pueblo area that this research has made possible (see map, page 743) enables us now to correlate the increases of rainfall that permitted these villages to expand and the drought years that placed upon them the heavy hand of starvation.

With careful archeological study we shall perhaps be able to trace the movements of clans and test tribal traditions which have been so often quoted as the early history of these people. In the combination of climatic conditions with tribal activities we have a rich field for studying the influence of climate on human history.

THE SOCIETY'S NEW MAP OF EUROPE

By Gilbert Grosvenor, LL. D., Litt. D.

President of the National Geographic Society

A NEW Map of Europe in 46 languages—such is the supplement which comes to the members of the National Geographic Society with this December issue of their Magazine. It is the first wall map published in the United States which shows in any considerable detail, and with consistency throughout, the geographical place names of the many nations of Europe and the Near East, spelled according to their local official forms. It represents more than three years of work in compilation, selection of names, drafting, engraving and printing, and, including the cost of its distribution to each of The Society's 1,300,000 members, an expenditure of more than $200,000.

Immediately following the signing of peace treaties, which established new national boundaries in Europe after the World War, the National Geographic Society issued to its members a new map of Europe as a supplement with the National Geographic Magazine for February, 1921. In the ensuing nine years one of the most notable changes that has taken place in Europe has been the development and intensification of national feeling with respect to geographical place names.

The Polish people, for example, insist that their capital be recognized by their own name for that ancient city—Warszawa, not an Anglicized Warsaw; the Estonians demand Tallinn, not the pre-war nomenclature, Reval, for their chief city; the Russians have supplanted St. Petersburg and Petrograd with Leningrad.

And so, over the whole face of Europe, new forms for old, or, more properly in many cases, older forms for old, have been established on the official maps of each nation.

THE NEW MAP WILL PROVE A BOON TO TRAVELERS

Doubtless many thousands of our readers, when traveling in Europe, have found difficulty in identifying the names of towns as spelled in the railway time-tables, or at the railway stations, with the places on the American or English maps which they were carrying. But this embarrassment will not occur when using the National Geographic Society's New Map of Europe, as our spelling of place names accords with local usage.

Every person expects others to spell his or her name as he or she spells it, wherever he or she may happen to be. Courtesy and custom will soon require that when we write to our friends in Europe we spell the names of their cities as these names are spelled at home.

The National Geographic Society has 50,000 members in Europe. Communications coming to these members from the National Geographic Society addressed to Rome (Roma), Venice (Venezia), etc., would probably seem to them as illiterate as we regard letters coming to us addressed to Nuova York, Filadelfia, Salzseestadt (Salt Lake City), or Waszyngton, which is the manner the names of a few of our cities are spelled in some European gazetteers.

MANY MAP NAMES UNFAMILIAR TO AMERICANS

Foreseeing the ultimate desirability of according to each nation recognition of its own approved geographic names within its boundaries, the National Geographic Society three years ago began to assemble the data for and to construct the present New Map of Europe. Some months after The Society's cartographic department had begun its work, the United States Geographic Board officially adopted the general principles of nomenclature upon which this map was then being constructed.

Many of the names on our map will have an unfamiliar appearance to the average user, and yet these are the place names to which letters should be addressed; they are the names which the traveler abroad will find on his time-tables of the various countries; and they are the names which will greet his eye as his train or boat or airplane passes station, dock, or landing field.

Wherever space has permitted without the sacrifice of legibility, the conventional Anglicized forms of commercially important or historically significant places have been included, in parentheses, but where only one name could be shown, the local official form is given.

As a convenience to the average English-speaking user of the map, the conventional Anglicized names of the countries themselves have been retained, for it would be too radical a departure from tradition and practice to expect one readily to identify "Shqipënië" as "Albania," for example. Usage will doubtless some day make it feasible to adopt generally on our maps the official names of countries as well as the cities and towns—Norge (Norway), Sverige (Sweden), Suomi (Finland), Deutsches Reich (Germany), Österreich (Austria), etc.

The official names of countries and their English equivalents are given in a table in the upper left corner of the map. The same table gives a useful series of geographical equivalents—words descriptive of physical or cultural features frequently used as integral parts of geographic names. For example, the Turkish word for river is *ırmak*. It is often combined with the proper name thus—Kızılırmak (Red River). It would be as tautological to refer to the Kızılırmak River (Red River River) as to speak of the Rio Grande River (River Grand River).

This table of equivalents will be found much expanded in the Index to the Map, more than 100 such words being included, with the countries in which they are used clearly indicated. Thus we have a key to the frequent occurrence of such terminologies as *hamina, hamn, haven,* and *havn* in northern Europe. Each means harbor in the country where it occurs—Maarianhamina, Nynäshamn, Bremerhaven, Köbenhavn.

Where a body of water borders several countries and each country has a different name for the same physical feature, the Anglicized form is given on the map, but each nation's official name for it is given in the Index to the Map of Europe, which may be obtained separately. For example, Baltic Sea is shown on the map, but separately and alphabetically listed in the Index are the names Östersjön (Swedish), Ost See (German), Balti Meri (Estonian), Baltijas Jūra (Latvian), Baltijos Jūra (Lithuanian), and Morze Bałtyckie (Polish). In cases where rivers flow through several countries the official name in each country is given, and the Anglicized name is shown in parentheses.

EMBASSY AND LEGATION OFFICIALS HAVE COÖPERATED IN COMPILING THE MAP

In compiling material for this map, the National Geographic Society has had courteous coöperation from many sources. Without exception, embassy and legation officials of every European country represented in the National Capital have assisted The Society in obtaining their most recent authoritative national maps.

In addition, geographical societies abroad have been consulted and have given valuable suggestions as to the choice of place names to be shown in congested areas. It not infrequently happens that while one city may have a slightly larger population than another, it is desirable to show the smaller city because of historical, strategic, or commercial significance.

On a map of the whole of Europe, where there are greater variations in density of population than in any other area of equal extent on earth, the problem of indicating the relative size of towns by the style of lettering was an extremely difficult one.

The solution adopted has been to show all cities of more than a million inhabitants by a shaded area instead of with a place mark, as in the case of Paris; towns of from 500,000 to 1,000,000 inhabitants are indicated in the type used for Marseille; towns from 100,000 to 500,000 are shown in the type used for Bordeaux; from 20,000 to 100,000, the type is everywhere the same as that used for Brest, and for towns of less than 20,000, lightface sloping letters are used, as in Château-Thierry.

TURKEY'S NEW ALPHABET USED

The National Geographic Society wishes especially to acknowledge the generous coöperation of the American Ambassador to Turkey, Mr. Grew, whose staff induced Turkish authorities to prepare preliminary lists of new place names in the New Turkish alphabet * prior to the official promulgation of those names. The Turkish portion of the map had been completed when news came from The Society's European staff representative in Constantinople that the new alphabet would be adopted. This entire section of the map had to be relettered.

In the past it has been the general policy of American map-makers to disregard diacritical marks; but, with the adoption of official forms in countries where such marks entirely alter the phonetic value of a letter, it has been necessary to employ them. For instance, the New Turkish alphabet consists of 29 letters, if the Ğ (with diacritical mark) is considered as a separate letter. Q, W, and X are omitted and the consonants Ç, Ş, and the vowels I (without dot), Ö, and Ü added.

It is a peculiarity of the New Turkish that the C (without cedilla) represents the sound of the English J. In no other language does the letter C represent this sound. The Ç (with cedilla) has the value of the English Ch and should not be confused with the French and Portuguese S sound. Thus, the former spelling Chatalja becomes Çatalca. The letter Ğ chiefly takes the place of the former Gh, as, for instance, in Boğaz içi (Bosporus). Ş has the same value as the English Sh. Thus we have Akşehir for the former Ak Shehir. The I without dot (capital and small letter) is pronounced like U in But, while with the dot (both over the capital and small letter) it takes the sound of I in Miss. The Ö and Ü have the German values. These are the most important features of this new transliteration system, and by keeping in mind these values the reader may convert the majority of the New Turkish names into the familiar old forms.

LETTER-FOR-LETTER TRANSLITERATION OF RUSSIAN NAMES ADOPTED

Great confusion has existed for years in the spelling of Russian names, chiefly because map publishers have attempted in many ways the almost impossible task of transliterating the Cyrillic alphabet into equivalent Latin alphabet values. The National Geographic Society in 1921 adopted the policy of a strict letter-for-letter transliteration. Thus Kiev was used in preference to Kief or Kieff; Kishinev in preference to Kishinyof. Unfortunately, many leading cartographers, as well as the Permanent Committee on Geographical Names, London, adopted the letter J to represent the Russian sound Zh, the equivalent of French J.

As the English J represents neither the French J nor the Russian Zh, the National Geographic Society decided to restrict the use of the letter J to its proper English value, and employed Zh to express the Russian J sound. Thus we have Nizhnii Novgorod, not Nijnii Novgorod. This system was adopted in 1928 by the United States Geographic Board.

The official Great Russian spelling has been followed over the entire Soviet Russian territory of this New Map of Europe, no attempt having been made to present the Ukrainian variant or Caucasian equivalent.

DIACRITICAL MARKS SIMPLIFY EUROPEAN PLACE NAMES

While it is recognized that a "royal road" to pronunciation of geographic names does not exist, the publication of this New Map of Europe with its numerous diacritical marks makes easier a more or less general formula for correct pronunciation.

The reader is, of course, familiar with the two salient facts concerning Spanish and Portuguese names—that the nearest English phonetic equivalent of the Spanish J is H, and that the phonetic value of the Portuguese Ão is approximately aun; but it is not generally recognized that a large proportion of the sounds most difficult to the English tongue are common to several languages. Thus the French and Dutch U is equivalent to the German, Hungarian, and Turkish Ü, and to the Swedish, Norwegian, and Danish Y (as in French *tu*). The German Ö is found in Hungarian, Turkish, and Scandinavian, and corresponds very nearly to the French *eu* (like English U in Fur).

The Swedish alphabet, besides the German umlaut Ä and Ö, also contains an Å.

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* See "Turkey Goes to School," by Maynard Owen Williams, in the NATIONAL GEOGRAPHIC MAGAZINE for January, 1929.

pronounced like O in Sore. Recently the Norwegians have in many instances replaced their Aa with the same letter. The Danish-Norwegian Aa must not be confused with the Dutch-German or Finnish Aa, equivalent to the English A in Father.

NEW STATES BANISHED OLD NAMES AFTER THE WORLD WAR

After the World War the official German, Austro-Hungarian, and Russian languages were banished from the new-born States of Central Europe, with the result that Estonian, Lettish, Lithuanian, Polish, Czechoslovak, and Serbo-Croatian came into their own as official languages.

Fortunately, these nations, with the exception of the Serb (Jugoslavia), use the Latin script, but because of the numerous diacritical marks and unusual combination of consonants, pronunciation of the new names at first sight appears to be far from easy. The problem is not so great as it would seem. In Latvia, Lithuania, Czechoslovakia, and Jugoslavia the letter Š appears frequently. This represents the English Sh; but in Hungary the unaccented S, in Rumania Ş, and in Poland Ś or Sz, also represent this sound. On the other hand, the Hungarian Sz is like sharp S. The letter C in all these countries except Rumania always is pronounced Ts, but in Hungary Cz and in Rumania Ţ also have the same value.

The English Ch in Lithuania, Latvia, Czechoslovakia, and Jugoslavia is represented by Č; but in Poland Cz, in Hungary Cs, and in Rumania C (before E and I) are the equivalents of this sound.

The soft Zh (French J) is rendered by Ž in Lithuania, Latvia, Czechoslovakia, and Jugoslavia, and in addition the Lithuanian Ż, the Polish Ż and Rz, the Hungarian Zs, and the Rumanian J have the same value.

The letter J in almost all cases represents the English Y, with notable exceptions in France and Rumania. The English J is represented in Poland by Dz, in Czechoslovakia by Dž, in Hungary by Gy, and in Rumania by G (before E or I).

Poland presents a greater variety of diacritical marks than any other country, but the difficulties of pronouncing that country's place names are minimized by recalling that Ł is the equivalent of the Ll in All, although frequently pronounced like the English W. The Ó is pronounced nearly like Oo in Boot, and the W like the English V, or F at the end of a word. Thus, Sokołów is pronounced Sokowoof.

The Czechoslovak Ř is most nearly represented phonetically by Rzh; thus Přerov is pronounced Przherov.

In pronouncing Lettish, Czech, Finnish, Hungarian, and Estonian geographic names the stress is always on the first syllable and in Polish on the next to the last syllable.

A NETWORK OF AIRPLANE LINES COVERS EUROPE

The inset map showing airplane lines now operated in Europe will prove of interest to the traveler and to the student of aviation. Many of these lines are not operated in winter and most of them are maintained with the aid of government subsidies. The lines, of course, are not permanently fixed, but the map gives the user a comprehensive idea of the places to which he may travel by air. Many of the lines are operated not daily, but once or twice a week.

Additional copies of the New Map of Europe and the Near East may be obtained from the headquarters of the National Geographic Society, in Washington, at $1 each for the paper edition (folded), $1.50 for the linen edition, mailed post-paid in a tube. The Index, listing more than 8,000 names appearing on the map, as well as many hundred Anglicized equivalents (familiar place-name forms), is available separately at 50 cents the copy.

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